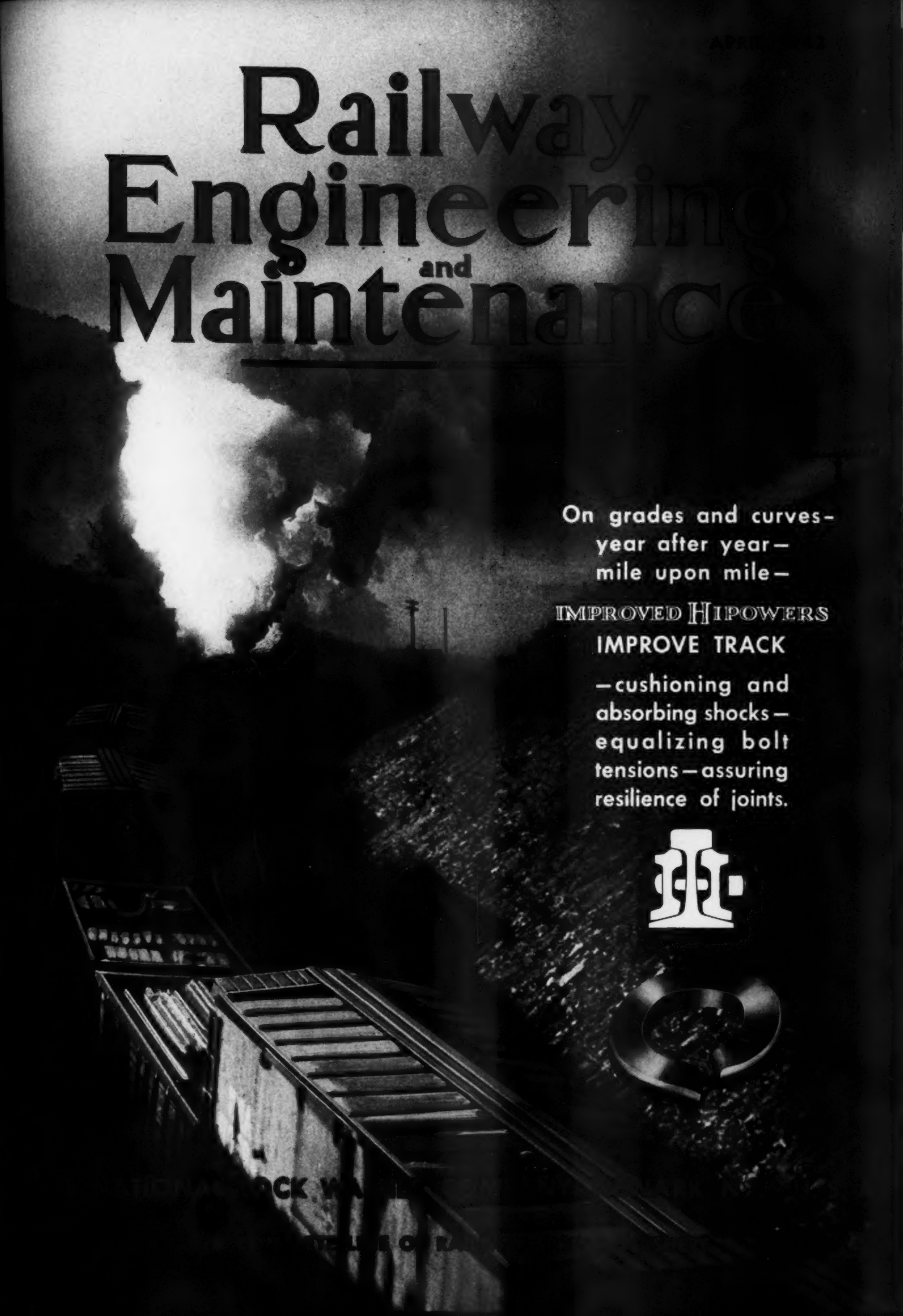
Railway Engineering and Maintenance



Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

Cars That His Engine Never Pulls
ARE THE ADVANCE GUARD FOR HIS RIGHT OF WAY

Long before the train comes zooming down the track and across the trestle, cars that are never in the string have helped to assure a clear track. To the signalmen who go out in all kinds of weather to check the functioning of semaphores, to the roadmasters who inspect every mile of roadbed, and to the section men and crews who keep the right-of-way in good condition, the dependability of Fairmont Railway Motor Cars means freedom from worry and more efficient performance of their duties. Offering many advanced features, Fairmont cars have also made a reputation for economy of operation and maintenance. This has been an important reason why more than half of the cars in service today are Fairmonts. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

Fairmont

RAILWAY MOTOR CARS

Performance ON THE JOB COUNTS

FAIRMONT S2 SERIES E in standard section work.

FAIRMONT M19 SERIES D in track supervisor's service.

FAIRMONT M9 SERIES D

One to Two Men. 500 Lb. Load Capacity

FAIRMONT M14 SERIES E for all light section service.

FAIRMONT 59 SERIES D car in signal maintenance work.

Chemical WEED CONTROL

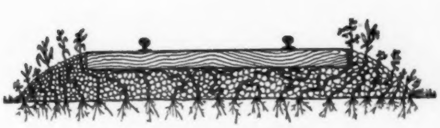
A STANDARD LABOR-SAVING METHOD

ATLAS "A" ARSENICAL **ATLACIDE** CHLORATE WEED KILLER

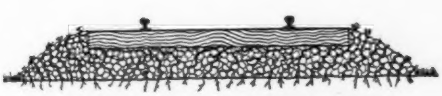
RAILROAD maintenance engineers everywhere realize that chemicals provide the answer to the weed problem. The old-fashioned, inefficient hand-weeding methods are an expensive and purely temporary remedy.

ATLAS "A" or ATLACIDE kills roots with a resultant reduction in the amount of weed growth with each treatment. As weed growth disappears, track conditions are improved, less chemical is required and maintenance costs are reduced. The ultimate goal of clean track maintenance at a minimum cost is soon reached.

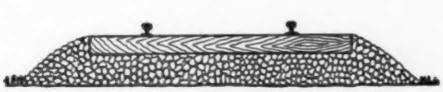
The use of ATLAS "A" or ATLACIDE to eradicate weed growth allows maintenance men to concentrate on other important work necessary to a well maintained track.



Before Treatment



After Treatment—ROOTS DIE



Final Result—CLEAN BALLAST

CHIPMAN CHEMICAL COMPANY, INC.

BOUND BROOK, NEW JERSEY

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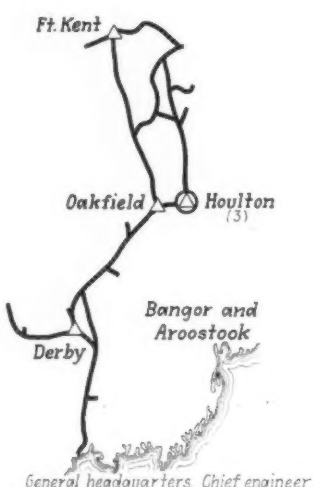
TO RAILWAY SUPPLY MANUFACTURERS

"At the Exhibit"



○ General headquarters, Chief engineer and superintendent of bridges and buildings.

△ Roadmasters headquarters.

•

Railway Engineering and Maintenance Goes Every Month to the **Chief Engineer,** to the **Superintendent of Bridges and Buildings,** to the **Four Roadmasters** and to **Five Other Subordinate Officers** Who Are in Training for Promotion to Supervisory Positions on the Bangor & Aroostook.

•

"Boss, you certainly had a long head on you when you arranged for our space at the National Railway Appliances Exhibit last week," said the star railway salesman to his sales manager.

"Bill, I made application for that space months ago," replied the sales manager.

"Before you knew there'd be a meeting of the railway engineers?"

"Not a bit of it. Don't you know that that association *always* holds annual meetings? It hasn't missed a single year since it was organized in 1900."

"That's an unusual record, Boss."

"Perhaps so, Bill, but not for that group. The harder the going and the more difficult the problems, the more there is for them to do and the more they do. That's a great bunch of men. But what caused you to like the exhibit?"

"Because it helped me so much, Boss. I saw so many people there whom it would have taken me weeks to contact in their offices, and I cleaned up a lot of troubles, too."

"You can always do that at an exhibit and convention that are run as business-like as these are, Bill. Those railway men come there for business. They're looking for information—not play."

"And that's the truth, Boss. They're on the job every minute. They certainly get a lot out of the exhibit."

"And, Bill, did you ever stop to think that the reason why we exhibit is one of the reasons why we advertise in *Railway Engineering and Maintenance?*"

"How's that, Boss?"

"To reach these serious-minded customers of ours at these widely scattered points, all over this country, with our message more frequently and more completely than we can ever do by personal calling. That advertising's your first assistant, reminding them between calls that we're still in business, telling them of improvements that we develop and in every way preparing the way for your calls."

"That's true, Boss, when you look at it that way. I've found that it's a great contact maintainer and time-saver."

"In brief, Bill, that advertising's insurance against their forgetting us between your calls."

"And it's good insurance, Boss."

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

SPECIFY PRESSURE BUTT-WELDED RAILS

For Station Platforms and Bridges

• Rails joined by the Oxweld Pressure Butt-Welding method are especially suitable for laying through station platforms and over bridges to reduce vibration and noise. Since oxy-acetylene pressure butt-welded rail is jointless, no batter occurs and maintenance costs are greatly reduced. Pressure welded rails provide a smooth track over which trains come and go with the least disturbance to station activities and without appreciable wear and tear on structures. This method, and the equipment which is used to apply it, are made available to the railroads as part of Oxweld's service program.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building   Chicago and New York

OXWELD
RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

INDUSTRY ANSWERS THE CALL!

A WAR MESSAGE
to
ALL EMPLOYERS
★ From the United States Treasury Department ★

WINNING THE WAR is going to take the mightiest effort America has ever made—in men, materials, and money!

An important part of the billions of dollars required to produce the planes, tanks, ships, and guns our Army and Navy need must come from the sale of Defense Bonds. Only by regular pay-day by pay-day investment of the American people can this be done.

Facing these facts, your Government needs, urgently, your cooperation with your employees in immediately enrolling them in

A PAY-ROLL SAVINGS PLAN

The voluntary Pay-Roll Savings Plan (approved by organized labor) provides for regular purchases by your employees of Defense Bonds through voluntary pay-roll allotments. All you do is hold the total funds authorized from pay-roll allotments in a separate account and deliver a Defense Bond to the employee each time his allotments accumulate to an amount sufficient to purchase a Bond.

You are under no obligation, other than your own interest in the future of your country, to install the Plan after you and your employees have given it consideration.

WHAT THE PAY-ROLL SAVINGS PLAN DOES

1. It provides immediate cash now to produce the finest, deadliest fighting equipment an Army and Navy ever needed to win. 2. It gives every American wage earner the opportunity for financial participation in National Defense. 3. By storing up wages, it will reduce the current demand for consumer goods while they are scarce, thus retarding inflation. 4. It reduces that percentage of Defense financing that must be placed with banks, thus putting our emergency financing on a sounder basis. 5. It builds a reserve buying power for the post-war purchase of civilian goods to keep our factories running after the war. 6. It helps your employees provide for their future.

To get full facts on installing the Pay-Roll Savings Plan, write TODAY to Treasury Department, Section B, 709 12th Street, NW., Washington, D. C.

U. S. Defense BONDS ★ STAMPS

This space contributed to National Defense by
YOUR NAME HERE

32,145 Firms With Over 17,700,000 Employees Have Installed the . . .

PAY-ROLL SAVINGS PLAN

Have YOU Started the Pay-Roll Savings Plan in YOUR Company?

Like a strong, healthy wind, the Pay-Roll Savings Plan is sweeping America! Already more than 32,000 firms, large and small, have adopted the Plan, with a total of over seventeen million employees—and the number is swelling hourly.

But time is short!. .More and more billions are needed, and needed fast, to help buy the guns, tanks, planes, and ships America's fighting forces *must* have. The best and quickest way to raise this money is by giving *every* American wage earner a chance to participate in the regular, systematic purchase of Defense Bonds. The Plan provides the one perfect means of sluicing a part of ALL America's income into the Defense Bond channel regularly every pay-day in an ever-rising flood.

Do *your* part by installing the Pay-Roll Savings Plan *now*. For truly, in this war, this *people's* war, VICTORY BEGINS AT THE PAY WINDOW.

Plan Easy to Install

Like all efficient systems, the Pay-Roll Savings Plan is amazingly easy to install, whether your employees number three or ten thousand.

For full facts and samples of free literature, send the coupon below—today! Or write, Treasury Department, Section C, 709 Twelfth Street NW., Washington, D. C.

MAIL THIS COUPON NOW

Treasury Department, Section C
709-12th St., NW.
Washington, D. C.

We want to do our part. Please rush full information regarding the Pay-Roll Savings Plan.

NAME. . . . .
POSITION. . . . .
COMPANY NAME. . . . .
ADDRESS . . . .
NUMBER OF EMPLOYEES . . . .

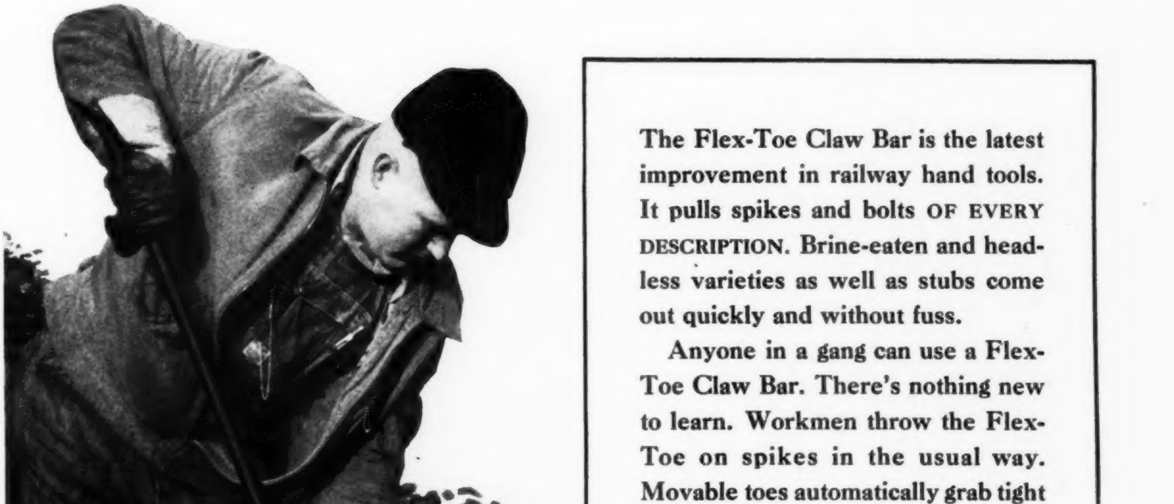
MAKE EVERY PAY-DAY . . . BOND DAY!

U. S. Defense BONDS ★ STAMPS

This space is a contribution to NATIONAL DEFENSE by Railway Engineering and Maintenance.

FLEX-TOE

THE CLAW BAR EVERY TRACK GANG NEEDS



The Flex-Toe Claw Bar is the latest improvement in railway hand tools. It pulls spikes and bolts OF EVERY DESCRIPTION. Brine-eaten and headless varieties as well as stubs come out quickly and without fuss.

Anyone in a gang can use a Flex-Toe Claw Bar. There's nothing new to learn. Workmen throw the Flex-Toe on spikes in the usual way. Movable toes automatically grab tight hold. Then by applying force to the bar, the spikes, bolts, stubs, etc., come out of EVERY PLACE. One man ALONE does these jobs without spike maul driving.

This bar was invented to make spike pulling safer and quicker . . . to remove spikes that were before practically impossible to get . . . to reduce costs, and to save ties. AND, IT DOES ALL OF THEM WELL. You'll find it worth-while to write for prices and literature on Flex-Toe Claw Bars.

WARREN TOOL CORPORATION • WARREN, OHIO

No. 160 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Our Objectives

March 25, 1942

Dear Reader:

I often wonder if you appreciate the concern that the editor of a publication like Railway Engineering and Maintenance holds over the extent to which his readers understand the purposes prompting the selection and manner of presentation of the material that appears in his publication. Is it meeting YOUR needs? Is it pertinent and helpful in the solution of YOUR problems? These are indicative of the questions that are constantly before me and my associates as we endeavor to visualize YOUR responsibilities and to bring to YOUR attention information that will be most helpful to you in the conduct of YOUR work.

And then, now and then, a letter comes in that cheers us by its discernment of our objectives and, by its commendation, spurs us on. Such a letter was received a short time ago from the chief engineer maintenance of way of one of our largest railroads. I quote from it.

"There are a number of features of Railway Engineering and Maintenance which I find very interesting. First are the technical articles and the information that you publish in regard to noteworthy work being done on different railroads. This is, of course, a matter of professional interest to me. And then, the personal news items are always interesting because I seldom pick up an issue that I do not see in these columns reference to a friend or at least to someone whom I know; that interest is, of course, personal but it leads me to beleive that this is one of the most worth-while departments of the magazine.

"Hand in hand with the two departments mentioned are the editorials, for I find that they give me a slant on the thinking of men who are just as much interested in the railroad industry as I am but who are looking at it from another point of view. I have realized for some time that in preparing your editorials you have the definite purpose of endeavoring to give your readers reliable information and at the same time influence their thinking in the way that you believe will be of benefit to the railway industry. Since these editorials are nearly always closely in line with my own thinking, it is needless to say that I think they are excellent and I often regret that they do not reach a larger readership beyond the railway industry.

"Two other features always interest me. One of these is the monthly conversation between the railway sales manager and his star salesman. The other is your personal letter that you address to your readers each month. As a matter of fact, these are the first two features of Railway Engineering and Maintenance that I usually read, not because I think they are the most important but because they are the ones that intrigue me most."

Letters such as this are greatly appreciated. We like your commendation; but even more we like to know what features you like most in Railway Engineering and Maintenance in order that we can distribute the space at our disposal to meet your needs most adequately.

I would like to hear from more of you. I wish that you would write me in larger numbers regarding your reaction to the work that we are doing.

Yours sincerely,

Elmer T. Howson

ETH:GP

Editor

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We're building hundreds of new and larger factories to make 'em . . .

We're using wood and shooting the steel at Hitler . . .

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For information on how timber and the TECO System are being used to produce all sizes and types of war structures, faster . . . with a minimum of "critical" materials . . . write for these FREE booklets.

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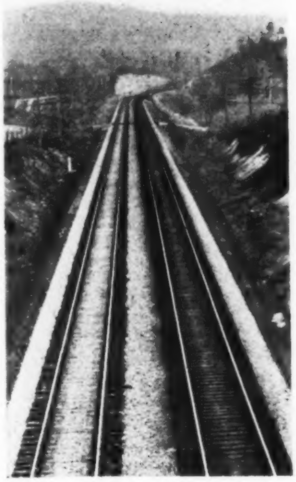


Published on the first day of each month by the

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 West Adams Street, Chicago

NEW YORK
30 Church Street

CLEVELAND
Terminal Tower

WASHINGTON, D.C.
1081 National Press Bldg.

SEATTLE
1038 Henry Bldg.

SAN FRANCISCO
550 Montgomery St.

LOS ANGELES
Union Bank Bldg.

Subscription price in the United States and Possessions, and Canada, 1 year $2, 2 years $3; foreign countries, 1 year $3, 2 years $5. Single copies, 35 cents each. Address H. E. McCandless, Circulation Manager, 30 Church Street, New York, N.Y.

Member of the Associated Business Papers (A.B.P.) and of the Audit Bureau of Circulations (A.B.C.)

PRINTED IN U.S.A.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

APRIL, 1942

Railway Engineering and Maintenance

It Can Be Done— It Will Be Done

THE American people are now engaged in the most gigantic war the world has ever witnessed. It is gigantic in the far-flung scope of its operations; in the magnitude of the forces flung at one another; in the extent to which it has been mechanized on the ground, in the air, on and in the sea. And because of these facts, transportation, and this means rail transportation, assumes a more important place than ever before; this in turn places a more important responsibility upon railway employees—upon each individual employee—than ever before.

Maintenance Men in Essential Service

Nowhere is this more true than in the maintenance of way department. In no sense inferior in importance to those employees who operate the trains carrying troops and munitions, it is the men of the track, structures and water service departments who, by their labors, make possible the movement of these trains safely, with regularity and without delay. In these days to an even greater degree than ever before, a railway can be no better than its tracks and structures.

It is of vital importance at the present time that railway employees recognize these facts. We have no desire to restrain any man so inclined from joining the armed forces but we do desire to emphasize that railway maintenance men are rendering a service that is of the most vital importance to the support of these armed forces and that, if it should fail, would cripple and in the end bring about the collapse of the efforts of those armed forces. In other words, service in the maintenance of way forces of our railways today constitutes a very real and important service in national defense.

Remarkable Railway Performance

Let us look at the current performance of the railways. This is best summarized in statistics for 1941 that, in complete form, are only now available. They show that the railways moved more freight in that year *than ever before*. For the *entire year,* they moved an average of 904,000 tons of revenue freight one mile *every* minute; in other words, they moved the equivalent of 904 trains, each carrying 1,000 tons of revenue freight, at the rate of a mile a minute for every minute of the year. Similarly, in last October, the period of maximum traffic, they moved the equivalent of 1,069 trains, each carrying 1,000 tons of revenue traffic, one mile each minute of the month. These performances established new high records of service to the country. And they were made without congestion, car shortage or delay.

As the year progressed, an increasingly large proportion of this traffic consisted of materials moving in connection with activities related to national defense—raw materials en route to mills and factories, finished or semi-finished parts moving to points of assembly, and completed equipment and munitions destined to points of use. Interspersed were large numbers of men in our armed forces, moving from place to place and culminating, in the six weeks following Pearl Harbor, in the transportation of more than 600,000 men, with their equipment, largely over long distances, with a precision and freedom from accident and delay that have won universal acclaim from military and civil authorities alike.

A Maintenance Achievement

These records reflect great credit on maintenance of way forces, for they demonstrate that these forces have provided roadway and structures of adequate condition and strength to carry this heavier traffic at the higher speeds at which it is now being moved. Yet, it is equally obvious that every train so handled takes its toll of the property and this deterioration must be made good if the roadway and structures are to continue to render this service. This latter fact warrants emphasis, for the very excellence of the railways' record during recent months is leading some people in responsible positions of high authority in government today to fail to realize that the railways need materials to maintain their physical plants.

At best, it must be recognized that, for a time, there will not be enough of certain critical materials to meet all necessary requirements. This is true especially of rail. On not a few roads, lack of earnings has forced retrenchments in renewals, with the result that much rail has been allowed to remain in track beyond its normal time for renewal. That a point of exhaustion has been reached on some roads at least is evidenced by the increased frequency with which rails are breaking under trains, a condition that not only endangers travel but threatens

to disrupt the orderly flow of traffic. It is essential, if these very real dangers are to be minimized, that a tonnage of rail at least commensurate with the current wear and tear be provided for renewals. This is a problem for railway managements to solve.

A Responsibility of Maintenance

Correspondingly, there is a responsibility for supervisory maintenance forces—that of installing promptly all new rail provided, both to gain the advantage of its added strength as quickly as possible and still more important, to release the second hand rail to meet the demands of ordnance plants and army camps for rail for additional trackage and thereby obviate the necessity for diverting to these plants new rail from the rolling mills.

Closely related to this problem of the shortage of new materials in critical categories is that of developing substitutes for materials that are difficult to secure. Here the possibilities are greater for bridge, building and water service forces than for track men. The substitution of wood or of mass concrete for steel or for reinforced concrete is a case in point. In these and many other respects the maintenance man must be versatile in these days—and in so doing, he is making a very real contribution to the war program.

Backing Up Our Forces

He can best back up his sons and brothers in the armed services by exerting every effort to so maintain the tracks and structures under his direction as to insure that they will carry the traffic of the nation without delay of any character and by so using the materials given him as to secure maximum service therefrom, thereby reducing to the practical minimum the diversion of essential materials from military uses. In all respects the railways are in a very real manner the nation's "first line of defense" and by such measures, the "overalls" of the maintenance of way employee become in all respects a "uniform."

Rail—

Must Seek Maximum Life

THE fears of many maintenance officers have come true. Following seriously restricted rail renewals throughout the depression period, amounting to an average of only 714,014 tons annually in the years 1931 to 1939, inclusive, as compared with 2,064,710 tons annually in the years 1925 to 1930, inclusive, these officers had begun, in the larger renewal programs of the last two years, amounting to 998,914 tons in 1940, and approximately 1,200,000 tons in 1941, to see some hope that the deferred rail renewals of the depression period could be overcome by progressively larger programs in the immediate future. In fact, in the face of rapidly increasing traffic and the requirements for peak transportation contemplated in 1942, the railways, at the request of the Office of Defense Transportation, prepared estimates of their 1942 requirements for rail, which, after revision at the request of the ODT, called for 1,632,394 tons for the year, and for the delivery of 657,110 tons during the first quarter of this year.

On February 1, first-quarter allotments of steel for maintenance of way and structures work were announced by the War Production Board, including 538,000 tons for new rails, "provided the requirements can be met without interfering with shell production"—a downward adjustment of 119,110 tons. Subsequently, these figures were cut still further to 350,000 tons for delivery during the first quarter, a further revision downward of 188,000 tons, or a total of 307,110 tons less than requirements estimated by the railways. Still later, it developed that special demands for particular war items were so serious that it appeared that even this reduced tonnage could not be secured during the first quarter, and, in fact, little rail was first scheduled to be rolled in the month of March. As a result of strenuous presentations by the Transportation Branch of the War Production Board, this situation has been improved somewhat for, according to Andrew Stevenson, chief of that Branch of the WPB, 150,000 tons of rail were finally scheduled for late March delivery. However, on the debit side, it has been made clear by the WPB that in exchange for new rail, the railways must prepare to surrender large quantities of relay rail for use by the army and navy in cantonment and ordnance plant construction.

In the face of these facts, and the definitely established needs of the railways for new rail to insure the safety and continuity of rail transportation, maintenance men have little cause for optimism. In fact, wherever the subject of rail is discussed, they are showing serious concern, especially in the light of recent accidents attributable to rail conditions, indicating that much of the rail in track is reaching its fatigue limit, if not its ultimate life as measured by wear and batter.

Aside from keeping their minimum needs for rail constantly before the ODT and the WPB, there is little that maintenance officers can do to insure that their requirements will be met as fully as possible. This much they must do, because to do otherwise would be to jeopardize the very basis upon which rests adequate war transportation—indeed, the entire war production program of the country. Beyond this, however, they have the responsibility to their roads and to their country to get the maximum possible service life from their present rail and from the new rail that will become available. This will require the greatest care in laying it and in keeping it properly surfaced; greater attention to joint and bolt maintenance, including protection against corrosion; more extensive use of rail-end hardening and of accepted methods of reconditioning battered ends; the more extensive and effective use of rail anchors and rail lubricators; greater attention to the alinement and elevation of curves; and, of no small importance, insistence upon the co-operation of the operating and mechanical departments in minimizing rail damage resulting from slipping drivers and the operation of certain classes or types of locomotives at speeds beyond those for which they were designed.

None of these factors affecting the life of rail are new to track maintenance men, having been brought into play extensively during the recent depression years, largely as measures of economy. This is fortunate, because, important as they were during the depression period, and

important as they still remain as means of effecting economies, they are of still greater importance at the present time from a strictly war effort standpoint, and, in the face of restricted deliveries of new rail, promise to become increasingly so in the months ahead.

Supplies—

Must Have Certain Definite Minimum

IN the tremendous war efforts now being made by our country, few industries are as indispensable as the railways. That we must have a huge, well-trained army, an abundance of weapons and ordnance, and hundreds of new ships, appears to be as fully recognized by the civil as by the military officers of our country; at the same time there is a growing appreciation of the indispensability of the railways of the country to this huge program. But, unfortunately, this is about as far as the interest and conviction of many extend in relation to the part to be played by this industry. They concede that the railways are necessary, and to this end show a willingness that they should have *some* of the materials and equipment that they need, when the facts are that the railways are *vital* to the success of our war effort, and, as such, must have at least a certain definite minimum of materials and equipment in order that they may continue to play their part successfully.

It is not difficult for even the layman to comprehend that the railways must have an ample number of passenger cars to move thousands of troops on a few hours' notice; that they must have hundreds of locomotives and thousands of new freight cars to move raw materials into war-producing plants and finished ordnance and equipment out of these plants; and that nearly every commodity of other than "machines of war" going to sustain our allies overseas must move to outbound ports by rail—but, unfortunately, it appears difficult for some of those charged with the conduct of our war effort through the control of materials to comprehend that there is anything to a railroad, necessary to its successful operation, except cars and locomotives—that a strong, well-drained roadbed, from rails to subgrade, is equally as essential to the safe, high-speed movement of war materials and our armed forces. In fact, there appears to be a disposition of little concern relative to the track structure—a disposition to take it for granted—apparently on the basis that the track maintenance forces, having already established a remarkable record of performance on a starvation diet of materials, can carry on indefinitely.

In view of indications of the lack of full appreciation of the part that the roadway and structures must play, or of their inability to function indefinitely without recouping their current losses due to wear and tear, those in authority must be reminded that all of the cars in the world can not move our war commerce over an inadequate, unsafe track structure; that the speeds demanded today by our war effort cannot be maintained over worn-out rail and under-maintained tracks; and that even derailments, slides, washouts and numerous other emergencies constantly facing the railways can seriously delay, if not completely disrupt, the movement of our war traffic if the maintenance of way and structures forces are not allowed to provide themselves with the necessary materials and equipment to cope with these emergencies as they arise. With even adequate materials and equipment, these forces face huge problems in keeping pace with the demands of traffic, and without them, failure to meet these demands is entirely possible *at a time when there must be no failure.*

No group of men in the country today is more patriotic than those in the maintenance of way and structures department of the railways, and none appreciate more fully the importance of the all-out production of planes, tanks, guns and munitions for our armed forces at the front, but, at the same time, there is no group of men in the country today who understand more fully the importance of adequate roadway and structures to the successful war transportation efforts of the country, which, alone, can deliver the planes, tanks, guns, munitions to those at the front. Such being the case, no more important duty rests upon these men at the present time, in spite of all of their other important duties, than to urge the needs of their department upon their superior officers, and on everyone else in authority, to the end that those in control of the allocation of materials and equipment of the country will not, through ignorance or lack of understanding of vital facts, defeat the very end toward which they are straining every effort—victory, in the shortest possible time through the proper co-ordination of our production, transportation and armed forces.

Reproduction of a Colored Poster Which Is Being Displayed Over the Union Pacific System, Emphasizing to Employees of the Road That They Are in the First Line of Defense of Their Country, Just As Much As Though They Were in Military Uniform

that of the existing flow lines at culverts and bridges. It is also necessary, therefore, to lower these streams, the grade of the side ditches being carried downstream until a point is reached where the ditch profile intersects the stream bed. This means that frequently it has been necessary to start the grading in the stream bed as far as a half mile downstream from the track and carry it upstream to the railroad. Then, by installing a new culvert at a lower elevation or, if at a bridge, by lowering the stream bed under the bridge (where conditions permit), it is possible to obtain the desired ditch profile.

Lowering the stream bed through a bridge opening means lessening the amount of cover over the bridge foundations, which is undesirable unless the foundations are adequately protected. To provide the necessary protection, we have employed with great success the expedient of driving sheet piling on the upstream and downstream sides of the bridge to conform with the sectional bed of the stream as desired, and then have paved the area between the bridge abutments and the sheet piling. The driving of sheet piling parallel to and outside the track structure usually is considerably cheaper than underpinning the bridge foundations.

Other Schemes

Where the construction of the bridge is such as to render this course undesirable, or where the underpinning of the bridge substructure would be too costly, other schemes for draining the deep side ditches are given consideration. One of the methods used involves the installation of a culvert pipe at a lower level than the bed of the stream, the purpose of the pipe being to drain the side ditches only. In such cases an open ditch is constructed from the new culvert to the point of intersection between the grade of the side ditches and that of the stream bed. At locations where this expedient is employed, it is necessary to construct a dike to prevent the stream from overflowing into the open ditch.

Not infreqently existing pipe culverts are left in position and are extended on the upstream side to span the deepened side ditch, in which event a suitable inlet, with masonry head walls, is provided at the upstream end of the abutments of masonry construction.

Legal Questions

In coming to a decision regarding the method of disposing of the water from the side ditches, it is necessary to give careful consideration to various legal questions. For instance, where there is any possibility that adjoining property will sustain damage as a result of an increased flow of water in a stream, with possible costly claims being made on the railroad, great care is taken to insure that water will not be diverted from one drainage course to another.

It is unquestionably a railroad's privilege to drain to an existing stream water from all areas within the particular drainage area. On the other hand there is a possibility of legal questions being raised regarding the volume of water which it is permissible for the railroad to deliver to a stream during any period.

After the profile and grade of the deepened side ditches have been established, the next step is to determine the cross-section of the ditches. Along our main line, which is electrified, it is necessary to take into consideration the necessity of maintaining the stability of the foundation for the catenary poles (the bottoms of the footings are usually nine feet below the top of rail), and with this in mind we are now limiting the depth of our deep side ditches to a maximum of eight feet below the top of the rails in the outside tracks. Also the top of the inside slope of the ditch is now kept at least 10 ft. outside the pole foundations where they project above the ground.

In cases where it is necessary to establish the side ditch below the eight-foot level, precautions are taken to protect the pole foundations. In some cases sheet piling is driven around the footings, while in others two ditches are constructed, including a standard eight-foot ditch near the track, beyond which a second ditch is constructed to the desired depth. Frequent outlets are provided from the high ditch to the lower one.

The sides of the ditches are placed on slopes of $1\frac{1}{2}$:1 or 2:1, depending on the character of the soil. The use of these slopes is contingent on whether it is possible to obtain the necessary property. If property cannot be purchased for a reasonable amount, the side ditches are constructed with retaining walls, or some other alternative plan is employed.

Left—Example of an Existing Pipe Culvert that Has Been Extended Upstream Across a Deep Side Ditch to the Berm Ditch

Right—The Smaller Pipe Shown Here Is the Downstream End of the Culvert Shown in the View Above. Larger Pipe at Lower Level Carries Flow From Deep Side Ditch

Berm Ditches

In all cases a berm ditch is constructed at the top of the outside slope of the deep side ditch, with frequent paved drains or flumes extending to the bottom of the latter. These drains are generally of brick or stone masonry construction and we are using sections of old water pans for lining them. To prevent their being undermined by erosion, the down drains are provided with substantial masonry headwalls at their upper ends and aprons at their lower ends. Similar

(Continued on page 281)

How to Clean Sewers and Other Underground Pipe Lines

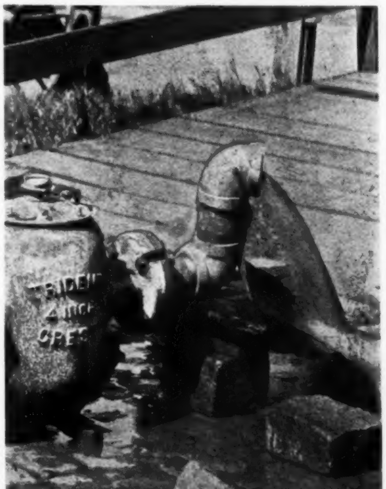
Report presented before the annual meeting of the American Railway Engineering Association in Chicago on March 17 describes details of chemical and various mechanical methods of doing this type of work. Sees definite economies and other advantages in restoring the flow capacity of choked or conjested lines*

DECREASE in the flow capacity of pipe lines is due to incrustations; the deposits of waste, mud or suspended matter; corrosion; tubercles; vegetable growth; and insoluble compounds formed by reason of temperature changes or chemical reactions within the lines, the last mentioned condition obtaining especially in water lines carrying treated water. Relatively few instances occur where pipe lines cannot be cleaned in place, and only in exceptional cases is it necessary to take up major portions of lines to remove stoppages or deposits. The choice of methods of cleaning cannot well be made a rule, but rather depends upon the conditions found in any particular case, such as the extent of the deposit, its composition and degree of hardness, the size and accessibility of the underground line, the time and costs involved, and the importance of maintaining service during cleaning operations.

Cleaning Sewer Lines

Restoring sewers and other underground pipe lines, otherwise in good physical condition, to maximum flow capacity is generally accomplished by either mechanical or chemical means. Mechanical cleaning has been found satisfactory and effective in most cases. Chemical solvents have a definite advantage over mechanical means where the pipe line is difficult of access and has a large number of bends and only short, straight sections. Where the opposite is true, mechanical scrapers or cutters are usually more conomical.

*Presented by a subcommittee of the Committee on Water Service, Fire Protection and Sanitation, of which R. E. Wachter, assistant engineer, Missouri Pacific, was chairman.



Small Flow in 4-In. Line Indicates Heavy Incrustation

Sewer lines are affected principally by deposits building up from the bottom, or flow line. Entire stoppage may be caused by vegetation, particularly roots, entering at defective joints and expanding rapidly. Unless the cause can be eliminated, it is usually found more economical in the end to provide cast iron or other pipe of similar quality with durable and tight joints.

Normally, sewer lines are provided with manholes from 300 to 400 ft. apart, which provide ready access to them. The vitrified pipe generally used in such lines is not capable of withstanding internal pressure to any great extent. Therefore, it is not recommended that pressures in excess of those encountered in a gravity flow sewer be used in cleaning them.

Mechanical Methods

Sewer rods of wood, having metal couplings at each end, are inserted into the sewer line at an upgrade manhole and are connected to form a rod of sufficient length to reach the next lower manhole. Buoyancy permits taking advantage of floating the rods in the direction of flow. A cable of sufficient strength may then be put through the pipe line to operate a scraper or cutting tool, which is pulled through with the assistance of a hand winch placed at the ground surface.

It is customary to use one hand winch at each of the extremities so that, after detaching the cleaning tool at the lower end, the cable can be pulled back readily and, when necessary, the operation repeated.

Spiral cutters attached to water hose, propelled by water pressure which also revolves the cutter head, may be used successfully to dislodge some root growth or other obstructions. The main discharge from the cutter head is directed backwards, washing the loosened particles toward the manhole. The starting point of operations is usually at the downgrade end of the stoppage, work proceeding upgrade so that all waste is carried away in the portion of the sewer which is clear of obstruction. In exceptional cases or where the obstruction is confined to short limits and is close to the upgrade manhole, it may be found feasible to work downgrade.

Flexible steel bands and coil spring cables are used to advantage in clearing some obstructions. However, the limit of operation by this means is not much in excess of 100 ft. Ball floats find use where a sandy or relatively easy scouring material is lodged in the line. The ball is smaller than the diameter of the pipe line. By thus restricting the flow area and forcing the flow along the bottom of the pipe, due to the buoyancy of the float, bottom deposits are scoured away. To retain control of the float, it is advisable to attach it to a cable so that it can be

Increased Flow Through Same 4-In. Line After Cleaning

removed from the line if obstructions will not yield, or when the float is prevented from moving forward.

The use of chemicals to dissolve grease, soap, paper and other organic matter is limited generally to bends, fittings, small size pipe and such lines as are not readily accessible, or where it is not practicable to employ mechanical means. These solvents are usually proprietary preparations sold in tight containers of limited weight to prevent deterioration. Admitted to the line affected at a selected opening above the point of deposit, the chemical employed carries on its solvent action with little or no evidence of the cleaning accomplished, except as may be estimated from the increased flow capacity. Applications of the solvent are made at intervals as the stoppage may require.

Underground Pipe Lines

Underground pipe lines, other than sewers, are usually capable of resisting internal pressures in excess of 100 lb. per sq. in., which makes it possible to use relatively high water pressure to aid in the cleaning process. Under these conditions, the mechanical method is used extensively and is generally the more economical and speedier method. Scrapers and cutting tools with stationary or revolving blades are attached to wire cables and by means of water pressure alone, or aided by a hand-operated winch, are propelled through the pipe line. The procedure commonly employed is as follows:

Water pressure is first shut off from the portion of the line to be cleaned. Short sections of pipe, approximately 3 ft. long, are then removed at the extremities of this portion of the line, which may reach a length of 1,000 ft. or more, depending on the number of bends and the extent and nature of the incrustation.

A 3/16-in. cable, with a carrier fastened to it, is then inserted into the pipe at the opening nearest to the pressure supply, following which the opening is closed temporarily by inserting a piece of pipe, fitted with a small opening directed upward at about 45 deg., large enough to permit the largest size cable used to pass through it freely. Water pressure is then turned on, forcing the carrier and small cable to the next opening.

Following this, the water pressure is again turned off. Then a larger steel cable, usually ⅜ in. in diameter, is fastened to the 3/16-in. carrier cable and pulled through the pipe by means of the hand winch. The temporary closure is removed, the cleaning machine is attached to the ⅜-in. cable and is inserted into the pipe. Then the temporary closure is again made and the water pressure is turned on. The cleaning machine is propelled entirely by water pressure or is dragged through the pipe line, the pull on the hand winch being aided by the pressure of the water behind the cleaning machine.

The cuttings or waste matter are washed ahead of the cleaning machine by the water passing through it, passing to the next opening, where they are flushed to the surface of the ground and disposed of. When the cleaning machine arrives at the end of its travel, the water pressure is turned off. The excavation is unwatered, using a diaphragm or other pump capable of handling the solids encountered. Hand-operated or powered pumps are used, depending upon the extent of the work.

Where flooding of the ground surface in the vicinity is likely to cause damage, a temporary pipe extension of suitable length is made to carry the water and waste to a safe point for disposal. In the latter event, it is advisable to provide a cableway opening through the side of the temporary pipe extension, similar to that provided at the other opening, and to attach a cable to both ends of the cleaning machine in order to facilitate repetitions of the cleaning operations, which are frequently found necessary to remove the deposit completely.

An Example of a Badly Incrusted Pipe Line

Where incrustations are relatively heavy, several sizes of cleaning tools are used, starting with the smallest and increasing the size to the point where the interior of the pipe is left clean and smooth. Some incrustations yield readily and can be removed entirely with one operation of the tool.

Light Pressure Cleaning

Cleaning equipment has been developed recently which has given satisfactory results with moderate water pressures. This equipment consists of a power unit, a flexible steel rod and several types of cutter heads, all mounted or housed on a truck. The appropriate cutter head, fastened to the flexible steel rod, is inserted into the pipe line at a selected location where a portion of the line has been removed previously. The pipe cut is left open. Cleaning or cutting operations proceed as the power unit rotates the flexible steel shaft and cutter head, at the same time pushing the shaft and head forward against the flow or water pressure in the pipe line. Cuttings and water are washed back to the open cut and disposed of.

By this method it has been possible to clean 2400 ft. of pipe line from one cut, working both ways therefrom, or up to the limit of the 1200-ft. of steel shaft available. Equally good results have been achieved by working against tank pressures in one direction from the cut, and against pump pressures in the opposite direction.

The flexible steel rod and cutter head method is adapted for cleaning pipe lines ranging from 2 to 40 in. in diameter. There are concerns which furnish the cleaning machines on a daily rental basis, or under contract based on the length of pipe line involved. The service may be had with or without superintendence, but in either case the owner of the pipe line defrays the costs incidental to excavation, pipe line cuts, material and other equipment needed, and the disposal of the waste. Some types of cleaning equipment may be purchased outright, which may be found advantageous where adaptability and the extent and frequency of cleaning warrant.

Pressure-Type Machines

The cleaning of water lines with presure-type machines has been used widely by the railways and my municipalities since 1910 for pipe sizes of 6 in. and larger. The pressure-type machine is of flexible design, fitted with pressure diaphragms and four or more rings of cutters for removing the incrustation. In lines from 6 in. to 12 in. in diameter, such machines are capable of going through valves and bends up to 45 deg. In lines larger than 12 in. in diameter, they will pass through a 90-deg. bend.

In operation, a fitting or section of the pipe to be cleaned is removed ahead of the pressure pump or other source of supply, the machine is inserted, and the line is restored. At the end of the line or section to be cleaned, a fitting or section of pipe is removed to provide for the free outlet of water and the removed incrustation.

The pump, or pressure from other source, is then applied behind the machine, forcing it forward through the pipe line. As it moves forward, the incrustation is washed ahead and out the open pipe end. The movement and travel of the machine can be detected and followed by walking along the ground above the line.

The water pressure required for this type of machine varies with the size of the line, ranging from 65 to 100 lb., with flows of 300 to 700 g.p.m. to wash the line ahead. This type equipment is usually rented on a foot basis for the size of pipe to be cleaned, and can be obtained with or without an attendant. The length of line to be cleaned on one run depends upon the thickness of the deposit.

Chemical Method

The chemical method of cleaning underground pipe lines is usually limited to the same extent as with sewer lines, being used principally for small size pipe, bends, fittings, pipe lines not readily accessible, and where mechanical means are impracticable. Cleaning is generally accomplished by means of inhibited hydrochloric acid, the addition of the inhibitor preventing attack of ferrous metal.

The cost of acid cleaning has been found to be relatively high. Aside from the cost itself, the disposal of partially active liquid waste into open channels or sewers should receive careful consideration beforehand. It has not been found practicable to neutralize the acid action completely in the cleaning process, and this may lead to complications or extra costs in disposing of the liquid waste in a safe manner.

Commercial inhibited hydrochloric acid is usually of 28 per cent strength. It has been used with good results when diluted with water to about 8 per cent, this strength being recommended to prevent violent reaction and the rapid formation of gas, with its attending difficulties of control.

The cleaning procedure consists of first completely isolating the section of pipe line to be cleaned. A storage tank for the acid solution, of ample capacity (three to four times the displacement of the pipe section to be cleaned), usually of steel or similar metal, is set near one end of the pipe line under consideration. From a point near the bottom of this storage tank, a pipe line is installed to the suction side of a pump, either hand or power-operated. The discharge from the pump is connected to the far end of the section of pipe to be cleaned, and from the near end of this pipe section a return pipe for the acid solution is installed. This return should be ended with a tee, with open-end pipe runs attached thereto, one extending vertically downward into the storage tank, and one vertically upward, the latter acting as a relief vent for gases formed in the cleaning operations. An additional valved return outlet is provided to permit wasting the returned liquid. This is desirable for the reason that, upon starting the pump, the liquid returned initially has no acid properties, and until active liquid appears, it should be prevented from reaching the acid storage tank, where it would not only dilute the acid but take up valuable storage space as well.

The Same Pipe, Shown on the Opposite Page, After It Had Been Cleaned

Examples of Increased Flow in Pipe Lines as the Result of Cleaning

	Pipe Line diameter inches	Length feet	Gallons Per Minute Before cleaning	After cleaning
Water column supply	12	525	380	2,000
Water column supply	12	517	864	1,793
Pump discharge	10	17,268	450	633.5
Fire line	6	925	260	396
Fire line	4	1,732	50	250

Frequent checks are made of the acid strength of the circulating solution. If a decrease is noted, fresh acid is added to the storage tank. When the strength no longer decreases, little, if any, further cleaning action may be expected, and circulation can be discontinued. Fresh water forced through the pipe line exhausts the solution still remaining in the line, until all acid has been displaced.

Upon the completion of cleaning operations, any active solution remaining may be recovered for further use. Usually, however, it is found more economical to waste it, selecting a location where this can be accomplished without detrimental effects.

Results and Conclusions

Results are given only for pipe lines other than sewer lines for the reason that, unless a sewer becomes wholly or partially inoperative, no effort is necesary, from the standpoint of economy, to incur any expenditure for cleaning it. There is decided economy, however, in maintaining pipe lines carrying water in a proper state of efficiency.

Pumping plants may be over taxed, and the delivery of water to important points of use may be so slowed down as to affect seriously the economy of operation and safety.

The cost of operating pumps varies closely in proportion to the time required for delivering a given volume of water. Any increase in flow capacity of a pipe line is, therefore, a measure of economy. Frequently, increased flow capacity by reason of cleaning has been attended by an appreciable lowering of pump pressures, and with it, less power consumption, as an added saving.

In supply lines under static pressure, the chief benefits derived from cleaning consist of eliminating delays in watering locomotives, speeding up operations in general where water is a factor, and, in some cases, a reduction in the fire hazard. Some of these benefits may be reduced to definite money savings.

Considerable and definite economies and other benefits have been secured by cleaning pipe lines, as evidenced by the results secured, a few of which, given in the accompanying table, are representative.

Tie Renewals—By Section

"When a Foreman Installs the Ties on His Own Section—He Makes Sure That Ties Removed Have No Further Service Life"

The Section Foreman "Takes Special Precautions to See That the Original Tie Bed Is Not Disturbed More Than Necessary"

Section Gang Method Best

By F. E. Schaumburg
Roadmaster
C. & N. W., West Chicago, Ill.

I AM a firm believer in the advisability and economy of making tie renewals with regular section forces. During my last 17 years on two different railroads, our season's tie programs have been carried out by section gangs, each crew spotting in the necessary ties on its own section. The only exceptions to this have been where stretches of track were surfaced out-of-face, this work being done with extra gangs which completed all necessary tie renewals in conjunction with the surfacing work.

Foreman Indicates Renewals

Every fall, each section foreman marks the ties which he plans to renew the following year. This is done by placing a horizontal chalk mark on the web of the rail above each tie to be renewed. He then reports his findings on a special form, showing the number of ties to be replaced in each mile. In multiple-track districts, the report indicates the number of tie renewals to be made in each mile on the individual tracks. On secondary and branch main lines, where hardwood and softwood ties are used, the foreman also indicates the number of each class of tie he recommends for renewal.

With these reports in hand, the roadmaster makes a field check of several miles on each section. In cases where the foreman's recommendations appear questionable, the roadmaster inspects the proposed renewals on the entire section. In checking the ties, the roadmaster crosses out the marks above those ties that, in his opinion, should remain in track, and marks any additional ties which he thinks have been overlooked by the foreman. The revised reports are then forwarded to the division engineer. As a further check on the tie renewals recommended, viewed from the standpoint of the division as a whole, an engineer from the division office then makes a field check of a portion of each class of track on the various roadmasters' subdivisions to be sure that the reports are a true representation of the tie requirements, especially as divided between the different classes of track.

This method of spotting and double checking ties for renewal has proved highly successful. It has taught the foreman to be very careful in selecting those ties for renewal, and they have shown increasing interest year after year. Through experience from year to year, the foremen become familiar with the necessary tie renewals on each mile of their tracks. They know that the installation of new ties is to be their section gangs' work, and they accept this responsibility and begin planning for the tie renewals long before the season actually gets under way. Since they are to renew the ties on their own sections, they know that as soon as they get their track spotted up in the spring they can start this work at once, in order to complete it at the earliest possible moment and then be free to get into other pertinent maintenance work that demands their attention.

After the tie season starts, the condition of the ties removed is checked by the roadmaster or by any other officer who may stop where the work is under way. If any ties are found that have further service life, they are pointed out to the foreman. However, after years of this routine, the foremen become quite expert in the renewal of only such ties as have no further life. The service life of the ties and their condition at the time of their renewal, of course, vary with the different classes of track, but since each foreman has first-hand knowledge of the speed of trains and density of tonnage on his particular section, he knows when a tie must come out in order to support the load properly.

Owing to the improved quality of the ties received in recent years, coupled with the various preservative

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or Specialized Gangs?

Two papers read before a recent meeting of the Maintenance of Way Club of Chicago—one by F. E. Schaumburg, roadmaster, Chicago & North Western, who upholds renewals by the section forces, presenting many convincing arguments, and the other by R. J. O'Connor, roadmaster, Chicago, Milwaukee, St. Paul & Pacific, who presents equally strong arguments for doing this class of work with specialized gangs

Large Specialized Tie Renewal Gangs Are Favored on Many Roads When the Renewals Are Sufficiently Heavy to Justify the Use of Such Gangs

Special Gangs For Heavy Renewals

By R. J. O'Connor

Roadmaster
C.M.St.P.&P., Minneapolis, Minn.

I FAVOR making tie renewals by section forces and by extra gangs, depending upon the number of ties to be renewed per mile and other specific conditions, but I will attempt to give you some reasons why I prefer specialized tie gangs where conditions warrant.

Tie renewals represent the largest single item of regular track maintenance. On our railroad, due to climatic conditions, practically the entire tie renewal program must be completed between April 1 and October 31. When renewals are exceptionally heavy, it is, therefore, a case of either adding a number of men to each section gang, or doing this work by special tie gangs. I prefer the tie gangs.

Our tie inspection is made in the fall for the following year's work. Careful inspection is made; the ties are marked and tabulated by miles. This work is done by the section foreman and the roadmaster, supplemented by the division engineer, or by an assistant appointed by him, with the view to keeping the tie renewals to the minimum required for safety. After the tie inspection is made, the data compiled are turned over and checked by the general officers of our road, who decide the specific locations where tie gangs will be worked. It is not our practice to employ tie gangs where renewals average less than 200 ties per mile, and such gangs completed only about one-fifth of the renewals on our road in 1941. In that year, special tie gangs renewed 21 per cent of our ties, section forces renewed 68 per cent, and ballast gangs renewed 11 per cent.

The ties for the coming season are generally received during the winter months and are unloaded and stored at station grounds. In the spring, just prior to the scheduled arrival of the tie gangs, each section gang is furnished a heavy-duty motor car and one or more heavy-duty push cars, with which they distribute the ties along the track to the points required. This distribution of the ties is done a week or 10 days ahead of the tie gang, except through station grounds, where the ties are distributed immediately ahead of the gang. In distributing the ties, they are placed work-wise in the proper location for further handling. The heavy-duty motor cars and push cars employed in this work are moved from one section to another in advance of the tie gangs, so there will be no delay to the tie renewal work.

Organization of Tie Gangs

In scheduling or programming the work of our tie gangs, much consideration is given to the location of the work, density of traffic and weight of rail, as well as to the kind of ballast and the ballast section.

Our tie gangs usually consist of the following:

1 flagman
2 men with claw bars pulling and piling spikes
14 men digging out cribs
1 man resetting anchors
3 men pulling out old ties

6 men preparing tie beds
2 men pulling in new ties
2 men back-filling for tampers
7 men tamping
  Note: 4 men operate electric tamping tools
  2 men nipping
  1 man pushing tamping machine
2 men with push car distributing material and picking up scrap
3 men placing tie plates with tie plate fork, or with small jacks on 131-lb. rail
4 men spiking
4 men dressing ballast
4 men piling and disposing of old ties
1 flagman
1 water man
1 tool man and brakeman
  Note: Brakeman to accompany motor car operator hauling scrap to nearest station, and hauling men to and from camp

Total—58 laborers

Supervision for gang:
1 general foreman
1 extra-gang foreman
1 assistant foreman
1 machine operator
1 assistant foreman to operate motor car
1 timekeeper

Sometimes, where the digging is hard, it is necessary to readjust the gang for an hour or two in the morning to give assistance to the front end. In such cases, the men usually spiking and tamping are moved up ahead. With this organization we average 11.42 ties per man-day on our high-speed main lines and 14.38 ties per man-day on our secondary lines. All concerned, including the chief operating officer, the general manager and the chief engineer, receive daily reports on the progress of each gang. These reports show not only the total number of ties installed, but also the number of ties per man-day and limits within which the work was done.

Advantages of Tie Gangs

The advantages of renewing ties by extra gangs when the tie renewals are heavy are as follows: (1) You can organize and carry out your work on a mass production basis, as each man is assigned to a special job, has less tools to handle, and becomes more adept than ordinary section men. (2) You have better control of extra gangs, as compared with adding men to the regular section crews, which must patrol the track and do many other jobs that greatly interfere with the work of renewing ties. Furthermore, in many places it is impossible to secure sufficient extra labor locally. (3) Through careful programming and scrutiny of extra-gang tie renewal work, the foremen in charge are always striving for the maximum output in work with the least interference with or by traffic. The operating department works very closely with these gangs, reducing their delays to a minimum; the speed of first-class trains is not restricted. (4) Another factor to be considered on our road is the differential that exists in the wage rates of our regular section forces and our extra-gang forces. By the use of the latter, we save approximately 10 per cent in our labor cost. (5) Another advantageous factor is that through the use of extra gangs our tie renewal work in any specific territory is completed in the shortest possible time, permitting the early removal or annulment of "look-out" or protective orders.

Section Gang Method the Best

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treatments given them, we have been successful in reducing the number of tie renewals per mile of track to the point where reduced section forces have been able to complete their tie renewals each year, in addition to performing the other seasonal work required of them.

Section Foreman Has Incentives

It has been my experience that when a foreman installs the ties on his own section, he takes an unusual interest in the work. He makes sure that the ties removed have no further service life, because he does not relish picking up an old tie and replacing it in some secondary track. He knows full well that he alone will be held responsible for the condition of the track after the ties are installed. Furthermore, he knows that he will have to put his track back in condition if this is not done at the time the ties are installed, and that he cannot do this sort of back work and still have time to keep his season's work up to date. Therefore, he takes special precautions to see that the original tie bed is not disturbed any more than is necessary to permit the placing of the new tie, because he knows that the less the tie bed is disturbed, the less the tamping that will be necessary, the less the settlement that will take place, and the quicker a uniform tie bearing will be secured after the new ties are placed.

The section foreman watches his men closely to see that each tie is tamped properly. Tie plates are not replaced until after several trains have passed, and when they are placed, the men have been taught to place the shoulder firmly against the base of the rail before the spikes are driven.

Each foreman has been cautioned, and his experience has taught him that a bad track condition is created when more than two new ties are placed adjacent to each other. Therefore, he avoids this except when surfacing is done out-of-face. Of course, the necessity for renewing adjacent ties has diminished as the result of the improved grade of ties being received, which has had the important effect of decreasing the number of tie renewals per mile.

It has also been found that, due to increased traffic, higher speeds and heavier equipment, even our best track, regardless of the type of ballast used, must be resurfaced every three to five years. This permits the spotting in of ties by section gangs in a sufficient quantity each year to produce minimum tie wear on the balance of the ties in the track, as well as the maintenance of good riding track between surfacing programs.

It has been my experience that section foremen must be given certain responsibilities to keep up their interest in the work they perform. Placing the renewal of practically all of their ties in their laps is one of the most important of these responsibilities. While the foreman is interested in securing production, he is also very much interested in the quality of the work. This applies especially to the installation of ties, not alone because of the consequences if ties are not renewed properly, but also because tie renewals involve one of the most expensive material accounts on his railroad. The foreman has, therefore, trained his men to do a good job, and since he has practically the same men each year, the work progresses smoothly with little loss of time due to turnover in his gang.

Distribution of Ties

In congested territories, ties for replacements are distributed by work train, but on outlying sections each gang must haul out its own ties with a motor car and push car. In the latter case, the ties are unloaded at the exact locations where they are needed. This is done with little loss of time, because this work is begun in advance of the tie season while making track inspections or on days when weather conditions will not permit other productive work. This method has been used because the ties are received from the treating plant during the fall and winter months, and are unloaded into storage piles on the station grounds. If the ties are received during the spring, they are distributed along the line by work train,

directly from the cars, as close to the points of installation as is possible. This, of course, eliminates the cost of piling them and rehandling them later by push car.

The use of section gangs to spot in ties might appear more expensive than certain other methods, but when it is considered that the foreman is working on his own section, with section laborers particularly trained in and accustomed to the placing of ties, it will be found that the overall cost by this method is no greater. The section force will do the work in such a manner as to prevent the development of bad track conditions soon after the ties have been placed. This, of course, will eliminate the necessity for having a spotting-up gang follow shortly after the tie installations have been completed, with sizable economy in this regard. There may be certain stretches of track not included in the regular surfacing program which will require surfacing, but the section foreman takes this into consideration and installs the ties in this territory as he does this surfacing, rather than spotting in the ties as one operation and surfacing later.

Summarizes Advantages

The following summarizes briefly the chief reasons for using section gangs for making tie renewals.

(1) Since it is up to the foreman to mark the ties for the following year's renewals, and since he must handle the ties at least once in any event, he should not be made to feel that he is not qualified to install the ties by having them installed by some other group or method. To do so is to cause him to lose interest in his work.

(2) Responsibilities are productive of good, honest and conscientious employees, and the responsibility of renewing ties on his own section will cause a section foreman to do all in his power to turn out the best possible job, so there will be no criticism from any one.

(3) The number of the insertions per mile of track has been so reduced through improved quality and treatment of ties that it is questionable if any more economical method can be found, except where track is surfaced out-of-face in long stretches.

(4) Each section foreman is keenly interested in his own section and usually considers it his own "little kingdom." Almost invariably, any work he does on his section is done with the view of producing track as good as, if not better than, that of his neighbor, and as economically as possible.

(5) The foreman's intimate knowledge of the conditions on his own section, including the speed and tonnage of trains, aids him in the installation of his ties.

(6) Through the use of section gangs, men are used who are experts in their line of work, the same men working on the same sections year after year, with almost no turnover to disrupt the gangs.

Pennsylvania Drains Roadbed

(Continued from page 274)

down drains, also with headwalls and aprons, are provided at the outlets of cross drains.

The bottoms of the side ditches are usually four feet to five feet in width; thus they are of ample size to handle any material that may be carried down the slopes. It is important that the slopes of the ditches be planted or cindered to prevent erosion. It has been our experience that locomotive cinders are entirely satisfactory for this purpose as their use eliminates the waiting period that is required before a plant growth becomes effective. Cinders are generally applied on the slopes to a thickness of about four inches.

To make the deep ditches effective, an adequate number of pipe cross drains must be installed to tap the water pockets and drain the inter-track spaces. To permit them to be cleaned, these drains should not be less than 12 in. in diameter. They should be placed on a gradient sufficient to insure self-cleaning and should be surrounded by a previous back-filling material. We prefer perforated pipe for the cross drains. Where the material comprising the roadbed is of a pervious nature, it is not generally considered necessary to install cross drains, except possibly at sags in the grade, as our experience has been that in such material the deepening of the side ditches is usually sufficient to dry out the roadbed and track.

Disposal of Material

In the construction of the side ditches, the wasting of the excavated material on the side away from the track is the least costly method of disposing of this material, provided that the necessary property can be secured for a reasonable sum. It frequently happens that this cannot be done, although it is sometimes possible to secure the property owner's permission to spread the dirt as he directs for a nominal consideration or at no expense.

If the material cannot be wasted in this manner, it must be loaded and removed. Trucks are very satisfactory for this purpose, although the loading of the dirt into cars spotted on a construction track, laid on the side of the ditch opposite the running tracks, offers a number of distinct advantages, providing the loaded dirt can be used or given away without expense to the railroad. For instance, there may be locations within the limits of a ditching project where low fills are in need of bank widening. In such instances material obtained in excavating the deep ditches can be loaded into a gondola car spotted on the construction track, which can be moved by a crawler tractor to a point opposite the narrow bank and unloaded by a crane in the clear of all main-line traffic. Similarly, cinders that are to be placed on the ditch slopes can be handled into position from cars spotted on the construction track.

Equipment Used

In the deep-ditching work on the Pennsylvania, it has usually been the practice to do the excavating with nine-ton gasoline-operated crawler cranes with 35-ft. booms and ¾-cu. yd. dragline buckets, working from the ground. These have proved most effective for use on wet, soggy ground. Larger cranes have difficulty in moving about unless the ground is stable, which is usually not the case.

It is generally the practice to employ one crane for stripping off the land down to the level of the top of the ditch, after which a second crane follows and constructs the ditch. To prevent the cranes from being flooded out, the work should proceed up the ditch grade. This procedure is not always possible on extremely large projects and it may be necessary to employ pumps for disposing of accumulated water. Almost all of our deep ditching work has been performed by railroad forces. Where blasting is necessary, we have our own powder man to handle the explosives.

We are highly gratified with the results obtained to date with deep ditching. There are still many miles of the work to be done, and we expect to continue it as available funds will permit, until all bad drainage conditions on the New York-Philadelphia line have been corrected. We are firmly convinced that deep ditching pays dividends in the form of increased rail life, improved riding conditions, economy in the use of other track materials and in permitting the more effective use of labor.

Drives Fluted

To Solve

Left—A Double-Acting Steam Hammer Operated by Compressed Air Was Used for Driving the Piles. Below—Pile Shells and Timber Form in Position at One of the Pier Footings

SUBSTRUCTURE problems of an unusually complicated nature were encountered by the Seaboard Air Line when it undertook recently to reconstruct a long viaduct at Richmond, Va. It was frequently necessary on this project to drive bearing piles for the new footings directly under the old viaduct where the headroom was limited, thereby presenting the problem of maintaining traffic over the viaduct during the course of the work. This problem was solved effectively by using Monotube piles which were cut into sections of the reduced lengths necessary to permit them to be driven in the limited headroom with a double-acting hammer, the sections being welded to each other as they were driven. The work was also complicated by the fact that the location of the new viaduct coincides for a short distance with, and is crossed at several points by, large underground waterways or sewers, necessitating special construction for supporting the concrete pier footings at these locations.

The viaduct with which this article is concerned carries the railroad's main line through the city of Richmond. About 3,400 ft. in length, it extends generally in a northeasterly direction from the northerly end of the company's bridge across the James river. Built in 1899, the old viaduct was a single-track structure consisting largely of deck plate-girder spans carried on steel bents. Because of its age and its relatively light construction, the viaduct was not considered adequate to carry present-day loads. In fact, as far back as 1936, a section of the structure about 350 ft. long at its extreme northerly end was renewed with heavier construction (Cooper's E-50 loading), using deck plate-girders on mass concrete piers. Renewal of the entire remainder of the structure was undertaken in 1941, with work on the substructure being completed in the fall. The superstructure, involving over 3,000 tons of steel, was furnished and erected by the Bethlehem Steel Company. Railway traffic was diverted from the old main line to the west track of the new viaduct on January 16 of this year.

The New Viaduct

In replacing the old viaduct, double-track construction was introduced throughout the length of the structure except for a distance of about 400 ft. at the extreme southerly end (adjacent to the James River bridge), where the new structure is of single-track construction. Except for the spans crossing over certain streets, the new viaduct consists of deck plate-girder spans on concrete piers which, for the most part, are carried on concrete footings supported on piles extending to rock.

For a distance of about 300 ft. from the northerly end of the James River bridge, the alinement corresponds closely with that of the old structue. For the next 1,000 ft. the two alinements diverge somewhat, the new location following a more direct course, after which they come together again so that, throughout the remaining length of the viaduct, the new northbound track follows closely the alinement of the original single track.

This undertaking required the construction of a total of 59 new piers, which present several different types of design. Fifty-four of the piers are of concrete construction and five are of steel. Of the concrete piers, 15 are of solid mass construction, while the remainder (39) embody a column-bent design generally comprising two rectangular columns cast monolithic with a reinforced concrete cap girder. In each bent the ends of the cap generally overhang the columns a distance of four feet, and are formed with curved surfaces and fillets on their under sides to present a pleasing appearance. Thirty-five of these bents are of the two-column design but the other four have three columns each.

The Footings

Except where special conditions prevail, the footings for the concrete piers consist of reinforced concrete slabs carried on piles extending to rock, which was found at depths ranging from 20 ft. to 40 ft. below natural ground. In this connection, it was apparent, during the design of the viaduct, that the driving of the piles would present a special problem throughout those portions of the

Shell Piles

Headroom Problem

During the reconstruction of a long viaduct on the Seaboard Air Line, it was necessary to drive bearing piles for the new pier footings under the old viaduct where the overhead clearance was limited. By using sectional piles, consisting of fluted steel casings, which were filled with concrete after being driven, the pile-driving operation was greatly simplified and was carried out without interfering with railway traffic. The details of this work, as well as some other interesting phases of the project, are described in this article

structure where the new footings come directly under the old structure, because here the headroom is only about 20 ft. or less. Obviously, the driving of full-length piles at these locations would have entailed an extremely expensive operation as it could not have been carried out without interfering with railroad traffic. In addition, such piles could only have been spotted where they could have been driven through the present structure, and in turn this might have involved considerable increase in footing area. Therefore, with the exception that timber bearing piles were used for a limited number of piers, particularly at the extreme northerly end of the viaduct where the existing structure did not interfere with the work, sectional metal piles were employed in most of the footings.

Use Steel Shell Piles

The piles used are known as Monotubes and are manufactured by the Union Metal Manufacturing Company, Canton, Ohio. They consist of hollow cylindrical steel shells, tapered and fluted, with 8-in. welded forged steel points, which are filled with concrete after being driven. Such piles were considered to be particularly advantageous for use on this project because they can be driven in sections of any desired length, a factor of primary importance in locations where the headroom is limited and overhead traffic must be maintained. Piles of this type were employed at 40 of the new piers that were constructed on this job, being used not only where the new substructure was located under the old viaduct but also in the section where the two structures were entirely independent of each other.

The piles used are of the type that has a tapered bottom section which is extended to the desired length, either in the shop or the field, with sections having a constant diameter of 12 in. About 800 of the piles were driven on this project, or an average of about 20 to each pier. The average length of the finished piles was about 21 ft.

Driving the Piles

Since the pile shells are relatively light, a McKiernan-Terry 9B3 hammer was used for driving them, which was operated by compressed air furnished by two Ingersoll-Rand compressors, arranged in tandem, having capacities of 500 and 320 cu. ft. per min. The hammer was hung from the boom of a power shovel, from which the dipper sticks had been removed to allow greater freedom of action when working under the old viaduct. A home-made driving head was employed, but no leads were used.

When driving piles under the old viaduct a 10-ft. pile section was driven first, additional sections being welded to the first as required or as dictated by headroom conditions. Because of the limited clearance, a spud pile was sometimes used to obtain a penetration of about 7 ft. to permit the first section to be started. The lengths of additional sections at such locations were governed by the available working headroom. Piles driven under the old viaduct are each composed of an average of about four sections.

Welding Sections

In making each splice in the piles, the lower end of the upper section was fitted into the lower section, and the two were then welded together by means of a continuous girt weld extending entirely around the pile. An average of only 2½ min. was required to make each of these welds. The piles were furnished on the job in lengths of 10, 15, 20 and 25 ft., and were cut into the required lengths with oxy-acetylene torches. After being

This View of the Pile-Driving Operation Under the Old Viaduct Gives An Idea of the Headroom Problem that Was Encountered.

driven, each pile was inspected on the interior by lowering an electric light into the shell, after which it was filled with concrete. The design of the footings was based on an allowable load of 35 tons for each pile.

By employing Monotube piles, and by driving them in the manner described above, the pile-driving operation was carried out without interfering in any way with the deck of the old viaduct or with the traffic carried by it. Despite the difficult conditions under which it was conducted, the work of driving the piles and of filling them with concrete was completed ahead of schedule in approximately 50 working days.

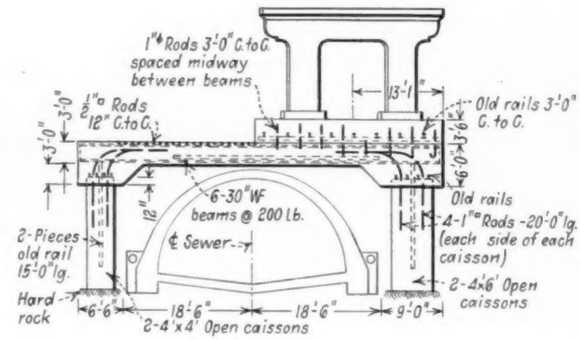
Waterways Present Problem

As noted early in this article, the presence of large underground waterways or sewers in the vicinity of the viaduct created a difficult substructure problem. The presence of these sewers is explained by the fact that the viaduct follows the valley of a stream known as Shockoe creek which is confined in an arch-type sewer having an over-all width of about 36 ft. At one point this sewer lies directly under the new viaduct for a distance of about 300 ft., with the result that six successive pier footings fall at least partially over the arch, the top of which is located only a few feet below the surface of the ground.

In addition, a box-type overflow sewer, 11¾ ft. by 17 ft. in section, crosses under the viaduct twice, passing directly under a pier at each crossing. The piers involved are Nos. 23 and 59. Also, a concrete flume, lying longitudinally under the south side of an intersecting street, is located partially under Pier 51.

The presence of these various underground structures required that special measures be taken at the piers involved to transmit the footing loads to the underlying rock formation without causing any part of them to be imposed on the waterway structures. With one exception, this was done by supporting the pier footings on "bridges" that span the sewers. At the six piers that fall over the arch sewer, the bridge at each pier consists of a concrete slab, reinforced with six wide-flange beams, as well as old rails and square rods, which spans between rectangular concrete caissons placed on each side of the arch sewer. Normally there are two caissons at each end of each slab, although at two of the piers, where the footings are situated over the sewer for only about half their lengths, there are four caissons under the overhanging end of each pier.

Showing Details of One of the "Bridges" That Were Built to Carry the New Piers Over the Shockoe Creek Sewer



At Pier 59, which is one of the two piers that fall directly over the box-type sewer, the scheme used for bridging the load across the sewer is substantially the same as that described above, but at the other location (Pier 23) the general scheme for bridging the sewer is varied from that followed at the other locations to the extent that, instead of the concrete caissons, three rows of Monotube piles support each end of the slab.

This View Shows a Line of the New Piers Before the Superstructure Was Placed. Note That They Extend Under the Old Viaduct

Special Problem at Pier 51

The situation at Pier 51 presented a special problem which was not susceptible to the type of treatment described for the other locations. As noted previously, the footing of this pier, which is located on one side of an intersecting street, impinges on the side wall of a large covered concrete flume, rectangular in section, which lies under the street. The top of this flume is located so close to the street level that it would not have been possible to use the same type of structure for bridging it that was employed at the other locations.

Flume Wall Interferes

The pier at this location is of the two-column type and its footing falls directly over the south wall of the flume, being located partly over the flume and partly outside the side wall. The expedient adopted here was to incorporate the flume wall in the footing by pouring concrete around it. To do this, the flume was dewatered and a section of the roof at the location of the footing was removed, after which a row of Monotube bearing piles was driven through the floor of the flume. A form was then built for that portion of the footing inside the flume and the concrete placed. Monotube piles were also used for that portion of the footing outside the flume. To tie the two parts of the footing together, 1⅛-in. square rods were placed transversely, being inserted through holes drilled in the flume wall. Also, since the top surface of the footing is about two feet above the top of the flume, lengths of rail were placed transversely on 3-ft. centers in the concrete above the flume wall.

The work described in this article was carried out under the general supervision of W. D. Faucette, chief engineer of the Seaboard, and L. H. Hornsby, engineer of bridges. T. M. Brady, resident engineer, was in direct charge of the work in the field. The substructure work was performed under contract by Haley, Chisholm & Morris, Inc., Charlottesville, Va., and was entirely completed within 100 working days.

Milwaukee

Left—Removing Nuts with Bolting Machines. Right—One of the Three Torch Men in the Foreground Flame Cleaning Rail Ends at a Joint, with the Remainder of the Gang on the Track, Immediately Behind

Flame-Cleans Rail Ends When Renewing Joint Bars

Milwaukee employs 35-man gang for applying reformed joint bars on high-speed main-line tracks, flame-cleaning the rail ends, where necessary. The flame-cleaning completely removes the heavy accumulation of scale, consisting of rust, dirt and oil, from the bearing surfaces of the rail ends and thereby provides a better fit of the reformed bars and improved joint conditions

IN August, 1941, the Chicago, Milwaukee, St. Paul & Pacific began a program of replacing existing joint bars on all of its 130-lb. rail with reformed angle bars, flame-cleaning the rail ends with oxy-propane torches when their condition required. About 130 track miles of high-speed double-track main lines, between Milwaukee, Wis., and Chicago and west of Chicago in the vicinity of Elgin, Ill., are involved in this program, of which 60 miles were completed in 1941. The remainder is scheduled for completion this year.

The 130-lb. rail involved was laid about 12 to 15 years ago and the rails were end-hardened in the track shortly after being laid. The joint conditions were good, with the exception of a slight amount of wear on the bearing surfaces of the rail ends and joint bars. Some corrosion and rust scale had also developed, especially on tracks with heavy refrigerator car traffic. The program of joint bar renewals was initiated to correct this condition before it became more pronounced and might necessitate other more costly and extensive work. Accordingly, the old 130-lb. R. E. straight joint bars were replaced with reformed head-free bars with a center overfill of slightly more than 1/32 in. This was the first time that flame cleaning or descaling rail with torches had been used on this road.

Large Gang Used

In the joint bar replacement work in 1941, a large gang was employed and the work was performed out-of-face and with very little interference to train movements. The gang was fully-equipped with power tools and oxy-propane torches and was provided with outfit cars, consisting of a water and coal car, a foreman's car, four bunk cars, a kitchen car, a dining car, a tool car, a supply car and usually only one material car. The outfit cars of the gang were moved from place to place, as required, by the local freight service.

Flame Cleaning

In its operations, the gang was split into two parts, part of the gang distributing and picking up material and the remainder doing the joint bar replacement work, including also the rail-end cleaning. The work was started with a pool of about 20,000 reformed 130-lb. joint bars, and as second-hand bars were released, they were picked up currently, shipped in to be reformed and shipped back to the gang, thus providing a continuous supply.

The cleaning of the rail ends was accomplished by scraping and bumping with lining bars to remove the heavy portion of the rust slabs and scale, and lighten the work of the torchmen, followed by heating with torches, or flame cleaning, to loosen the remainder of the rust, and finally by wire brushing. Propane gas and regular oxy-acetylene cutting torches were used in the flame cleaning work.

The torches were equipped with special tips designed for use with propane which had 12 preheating flame holes. A slightly oxidizing flame was used, and the application of the heat was a regular descaling operation in which a high degree of heat is applied to the surface for a short interval, which causes the scale and rust to cockle and loosen, without appreciably heating the steel underneath.

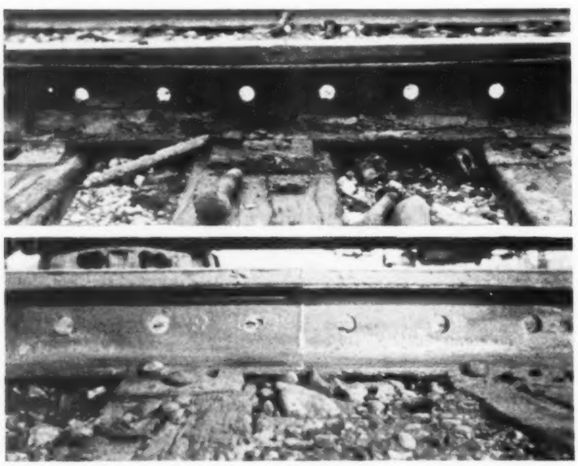
Results

The results with the propane gas were very satisfactory. The use of propane gas provides a flame with a temperature of 4200 deg. F. The sudden application of a high temperature to the surface is considered desirable in descaling work. The temperature of the rail ends after heating was approximately 300 deg., well below any limits that might cause damage to the steel or set up any internal stresses. Metal preservative was applied to the cleaned surfaces after the wire brushing while the rail ends were still warm. The metal preservative was a compound known as a liquid asphalt rail coating, consisting of cutback asphalt dissolved in a light fuel oil. Because the cleaned surfaces are dehydrated by the flame cleaning and because the rail ends are still warm when the metal preservative is applied, a good bond between the metal preservative and the steel is obtained, protecting the rail more effectively.

Organization

The portion of the gang engaged in the joint bar replacement work was under the jurisdiction of an extra gang foreman and one assistant foreman and the operations of the men engaged in this work were as follows: Two operators, one on each rail and each equipped with a bolting machine, removed the nuts from the joints. Two men with sledges followed, removing the joint bars. Four men with lining bars, two on each rail, bumped and scraped the exposed rail ends, particularly at the junction of the web and base and along the base to loosen and remove a large portion of the heavy incrustations of rust and scale. Two of these men worked ahead of the torch men and two worked along with the torch men, scraping the rail at the time the flame was applied. Three men with torches followed, heating the exposed rail ends to remove the remainder of the scale and rust, giving particular attention to the bearing surfaces. The torch men were accompanied by a push car in charge of one man, which was loaded with propane and oxygen cylinders. The push car man also watched the hose lines and handled the connections to the cylinders.

Immediately behind the flame-cleaning operations, one man with a power-driven wire brush, brushed the rail ends clean. A flexible-shaft power-driven cross-slotter, equipped with two ½-in. wire brushes mounted together on the same spindle, was used for this work. The power unit for the wire brush, a small gasoline motor, was mounted on a second push car, which was in charge of one man. This push car also carried a reserve of oxygen tanks, kegs of bolts and a supply of the metal preservative for the rail ends. The man in charge of the second push car picked up the kegs of track bolts which had been distributed along the track by the material gang, and unloaded empty kegs for use in gathering and loading the released bolts. Behind the second push car one man with a 4-in. brush painted the rail ends with the metal preservative and also distributed six new bolts at each joint. Three men followed, hanging the reformed angle bars and starting all six nuts. Two men with two bolting machines completed the work by tightening the nuts. Two flagmen completed the personnel of this gang.



Above—Rail Ends at a Joint Before Cleaning. Below—After Cleaning. Note the Pitted Condition at the Base of the Web at the Right, Which Has Been Exposed by the Cleaning.

Flagging Operations

All of the work of the main gang was carried out under a protective-restrictive speed order. The two flagmen kept 1¼-mi. from the gang as it moved along. They were provided with a yellow flag and torpedoes. Upon the approach of the train they placed two torpedoes and gave a signal with the flag, whereupon the engineer was required to slow down to a restrictive speed before reaching the gang. Another flagman with a red flag was stationed approximately 600 ft. from the gang, but since the gang could make the track safe in about three minutes, the foreman usually gave a high ball before the train was close, which was relayed to the locomotive engineer. Trains then proceeded without further delay and with very little loss of time. Before the high ball was given in each case, it was required that both joint bars be in place and one nut be fully tightened on each joint. This procedure applied to all trains, except the streamlined Hiawathas, in which case the track was cleared in advance and these trains were not required to slow down.

The remainder of the gang, which distributed and picked up material, was under the jurisdiction of an assistant foreman and operated a motor car train consisting of two heavy-duty motor cars, one at each end of the train, three five-ton push cars and one trailer car. In addition to the assistant foreman, this part of the gang included a motor car operator and five laborers.

Production

The gang was operated 6 days a week, 8 hours per day. An average of nearly 350 joints per day were renewed, or nearly 10 joints per man per day. The flame cleaning work required four 100-lb. tanks of propane and 54 oxygen tanks per week. The cost of the flame cleaning alone, over and above the cost of other operations, amounted to approximately 15 cents per joint.

This work was done under the general supervision of W. H. Penfield, chief engineer of the Milwaukee, and under the immediate supervision of C. E. Morgan, superintendent of work equipment and welding. Ed Lamp was the foreman in charge.

What's the Answer?

Why Have Motor-Car Accidents?

What are the most important factors contributing to motor-car accidents? What can be done to overcome them?

Man Failures Cause Most

By Armstrong Chinn
Chief Engineer, Alton, Chicago

If I had written the question I would have specified the factor instead of factors, for I am convinced that 90 per cent of all motor-car accidents are the result of a single factor, namely, man failure, or the failure of the man in charge of the car to do some one of the many things he should do to operate the car safely. Motor-car manufacturers have built strength and safety into their cars, and there is rarely an accident that can be traced to failure of a part of the car.

With few exceptions, any part of a car that becomes worn and is, therefore, not functioning as it should, can be detected before failure and can be replaced or repaired as needed. I have known of only one motor-car accident that was caused by the failure of a part in such a way that the man in charge of the car could not have detected the impending failure in advance of the accident. In this case, an axle broke in its bearing.

It is my observation that the most common man-failure accidents result from:

1. Failure to get a proper line-up.
2. Failure to observe the line-up after it has been obtained.
3. Failure to control the speed of the car.
4. Failure to approach street and highway grade crossings under control.
5. Failure to load tools and materials on the car in a safe manner.
6. Failure to keep lookouts in both directions.
7. Failure to organize the gang properly for handling the car on and off the track; that is, a place for every man and every man in his place.
8. Failure to know that the car is in condition for service before it is used.

The only way to stop accidents from these causes is to train the men in charge of the operation of motor cars so thoroughly that doing the right and safe thing at the right time will become second nature to them. Operating a motor-car is no job for a chance-taking or a careless man. It has been said truly that "the best safety device is a careful man."

They Repeat Themselves

By C. H. Ordas
Supervisor of Motor Cars, Chicago, Milwaukee, St. Paul & Pacific, Chicago

A review of motor-car accident reports during the last 26 months leads to the following conclusions:

1. None of these accidents was caused by or attributed to mechanical faults or defective materials in the motor-cars involved, which could not have been corrected before using the car.
2. Many of these accidents resulted in personal injuries and some in fatalities.
3. Most of the accidents, in fact almost all, covered by these reports resulted from what are usually termed man failures.
4. Many of them happened to cars that were being operated by men with years of experience, who either vio-

To Be Answered in June

1. *What hazards are involved in the renewal of turnouts? What measures can be employed to overcome them?*
2. *What are the principal causes of personal injury in bridge and building work? How can they be eliminated?*
3. *When surfacing track out of face, how close to the jacks should the tamping be carried before they are moved ahead? Why? Does the amount of the lift make any difference? Why?*
4. *Is it practical to preframe ties that are to be treated and applied to deck plate girders? If not, why? If so, how is the necessary information obtained? What provision should be made for rivet heads?*
5. *When making a heavy raise on stone ballast, what interval should elapse between the first and second lifts? On gravel? On chatts? Why?*
6. *In view of the restrictions that have been placed on civilian uses of iron and steel, to what extent can wood pipe be adapted for railway water service? What are its advantages and disadvantages, compared with steel and cast-iron pipe?*
7. *How long before they are to be inserted should ties be treated? Why? Does the species of wood or the kind of treatment make any difference?*
8. *Is there any advantage in sanding paint coatings on station and other buildings? If so, what? If not, why? How can this be done?*

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

lated the rules or forgot them, or who took chances.

5. As a result of these accidents, many of those who were held responsible were taken out of the service either temporarily or permanently, or demerit marks were placed against them on their service records.

6. These accidents tend to repeat themselves, for notwithstanding this disciplinary action, others had similar accidents later, from the same causes.

7. It is obvious that if the number of accidents is to be reduced, there must be a greater degree of alertness on the part of those who operate the cars, and observance of the rules pertaining to their operation and maintenance. There must also be an improvement in the supervision of these employees, as the following selected cases indicate:

1. Collision with a train resulted from operator's watch having stopped. A similar accident occurred because the operator's watch was slow.

2. Car was operated in a fog—collision because of poor visibility.

3. Several cars were hit by automobiles at highway crossings.

4. Improper lead on the front wheel of a car caused derailment.

5. Failure to replace wheels that were worn beyond the safe limit caused derailment.

6. Operator did not see obstruction on rail, which resulted in derailment.

7. Car was run over a derail and it worked; that is, the car was derailed.

8. Animals crossing the rail were not observed until too late to stop the car, causing it to be derailed.

9. Obstruction in flangeway at grade crossing not observed, causing car to leave the rails.

10. A nail instead of a tight-fitting cotter key was inserted in a slotted nut on the end of an axle; the nut and wheel came off, derailing the car.

11. The operator attempted to beat an automobile across a grade crossing. He failed to do so, and the automobile hit the motor car.

12. Tools were not loaded properly in the tool tray; some of them slid over the end of the tray and derailed the car.

13. Two cars met on a curve. Both were running too fast to be stopped after they came into each other's view—result, a collision.

14. The foreman left his car on the track while picking up a fallen telegraph pole; the car was struck by a train.

15. The foreman failed to send a flag around a curve where the view was quite restricted, and the car collided with a work train.

16. One foreman placed too much reliance on an old line-up and met an engine not on the line-up. Another, out on the line on Sunday without a line-up, had his car hit.

These cases are typical of the nature of the accidents to motor cars, and it will be observed that every one could have been avoided easily. They are examples of what an experienced man should not have done and of what a careful man who wishes to avoid accidents does not do.

Why Do Water Mains Leak?

What are the causes of leaks in water mains? How can they be detected? How repaired? How prevented?

Reasons Are Varied

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

Leaks occur in water mains from a rather wide variety of reasons. Probably the most common is poor workmanship in making the joints or poor engineering in planning the pipe installation. The jointing materials, whether lead and jute or substitute materials, should be installed by experienced and careful workmen. The pipe ends should be inserted full depth, and the "yarning" placed carefully to a uniform depth for the jointing material which, in turn, should be heated and poured properly and then well calked around the entire perimeter of the joint. The line and grade of the pipe trench should be correct to eliminate cramped joints. The soil in the trench should be such as to prevent unequal settlement.

Pipe joints should not be placed under railway tracks or elsewhere where they will be subject to unusual vibration or pressure without encasement or other suitable protection. The possibility of corrosive soils and of electrolysis should be studied and eliminated. In other words, when installing water mains of medium to large size, one should realize that this costs considerable money and constitutes an important utility. For these reasons, full engineering study should be devoted to the planning and estimates, as well as to the quality of the workmanship. A pressure test should be made before the trench is backfilled, if this is possible. If these precautions are observed, leaks are less likely and will seldom occur.

Old pipe lines, most of which were laid in a haphazard fashion, may be improved under some conditions. Leaks of the "repeater" type should be checked and measures of prevention adopted, instead of excavating to the pipe and calking the joint at frequent intervals. A permanent cure may be effected by the use of proprietary pipe clamps, by encasement or conduits, or by relocating one or more joints to non-leak locations. The cause of leaks of this kind usually are vibration, poor joints or unusual water pressure.

Fortunately, in most cases, the evidence of leaks becomes visible on the surface of the ground and they are thus easily detected, but a minority of leaks are hidden; that is, instead of flowing to the surface, the water drains into porous ground and cannot be detected visually. In these circumstances the use of leak detectors is advisable, several varieties of which are on the market.

Perhaps the oldest and most comprehensive way of checking leakage is through a pitometer survey. This is used in large cities where suspected areas are segregated, measured and surveyed by a trained engineering party. For smaller water users, the usual leak detectors are useful. They are generally of either the visual or the audible type. The former indicates the proximity of the leak by the difference in the conductivity of the saturated and the non-saturated soil in the vicinity of the leak, while the latter instrument conveys the indication through a sound apparatus resembling a telephone ear piece. In general, the former instrument is preferable, for interfering noises do not affect its use.

Joints Pull Apart

By E. C. Johnston
Water Service Foreman, Baltimore & Ohio, Punxsutawney, Pa.

Leaks in water mains are caused most commonly by the pulling apart at the joints, by reason of expansion, contraction or settlement of the ground or supporting structures. Less common causes are water hammer, vibration and poor carriers or foundations; still less common but troublesome causes are poor installation and electrolysis. Most leaks can be detected by outward evidence of flow from the mains, but if there are hid-

den leaks where the flow reaches sewers or other drains, or is absorbed by the surrounding ground, meter readings, pressure or sonoscope tests may be necessary to locate the loss of fluid from the main.

Wrought-iron and steel pipes are repaired most readily by welding. Cast iron may be bronze-welded, but repairs are made usually with split sleeves or bells, leaded tight. If leaded joints are loosened they can be releaded and, to prevent recurrence of the trouble, they may be clamped. The best prevention against leaks is to use suitable materials of good quality, put together properly, with protection provided. Vibration, water hammer, corrosion and frost can be guarded against by correct design and good workmanship. Abrupt angles should be avoided. Heavy surface loads should not be imposed on underground mains which should be insulated against soil corrosion and electric currents where this is practicable.

One or Separate Gangs?

In view of the present marked expansion in maintenance activities, should carpenter gangs be expected to do both bridge and building work, or should these classes of work be assigned to separate gangs? Why?

Work Widely Scattered

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

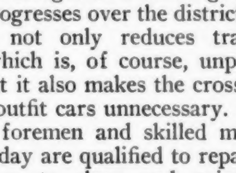
Heavy maintenance and renewals of both bridges and buildings have decreased materially in volume during the last 15 years. This has come about from two primary causes. For a quarter century there has been a definite trend toward the substitution of permanent (concrete and steel) for temporary (timber) bridges. Even where the timber structures have not been renewed with permanent materials, creosoted wood has replaced the untreated wood of the previous construction. As a result of this movement, less repairs and fewer renewals have been necessary, thus causing a material reduction in the size of the forces engaged on this work.

Likewise, during the years, a surprisingly large number of frame buildings have been replaced with structures of steel, brick and concrete. As a result of the decrease in passenger traffic which began 20 or more years ago, of the changes in operating methods which have been going on with such rapidity for more than a decade, of changing traffic requirements and of other factors, a considerable number of buildings have been retired. Again, sections have been lengthened and many company houses have been abandoned and torn down. For these reasons, the volume of building work has been greatly reduced, making it unnecessary to maintain so large a force as was necessary formerly.

Under these conditions it became necessary to reorganize the bridge and building forces somewhat drastically. Since the work that must now be done is quite widely scattered, and since we are endeavoring to provide power tools for all of our gangs, we do not find it economical to equip two gangs and send them into the same territory. We have, therefore, equipped our gangs with power tools that will enable them to do both classes of work, taking the entire program on a district out of face, that is, completing all work that is to be done on both bridges and buildings as the gang progresses over the district. This system not only reduces traveling time, which is, of course, unproductive, but it also makes the cross-hauling of outfit cars unnecessary.

The foremen and skilled men we have today are qualified to repair and renew or to clean and paint both bridges and buildings. With the increasing use of power machines and tools for both repairs and renewals to these structures, many of which can be used for both types of structures, it is a distinct advantage to have the gangs do both bridge and building work. The new conditions have, however, given added importance to the need for foremen capable of handling complicated jobs and heavy work. Obviously, some foremen are better than others and one should endeavor to assign the most reliable and careful of these to the more important work.

This consideration applies to safety as well as economy. At large terminals where practically all of the work is in connection with buildings, in which there may be considerable machinery as well as machines, the hazards should be given consideration in selecting the foreman for the work.



Has Changed His View

By General Inspector of Bridges

For many years I was unalterably opposed to mixing the work of bridge and building gangs, because of the wide differences in the tasks they were called upon to perform and in the methods by which they did them. All carpenter work was done by hand and men were specialists, that is, cabinet makers, house carpenters, glaziers, etc., and the man who could do a first-class job of framing a timber trestle was worth his weight in gold. Furthermore, most of our bridges were constructed of untreated timber, and there was no lack of work for the bridge gangs.

Many of our timber trestles have been replaced with steel spans; others have been filled and concrete boxes or pipe culverts have been substituted for the larger openings. Although there has been a material reduction in the amount of timber trestle on the road, about half of the total length of all bridges is still of timber construction; yet the volume of repair and replacement work has been reduced greatly, out of proportion to the reduction in this type of structure, for we do not now use any untreated material in these structures, and it is now only a fraction of what it was 25 years ago. Furthermore, the amount of field work in the framing of timber is negligible today, for all of our treated material is framed and bored at the treating plant before it is sent to the retorts, except the bolt holes for sway bracing.

Similar, although perhaps not so drastic changes have occurred in the building field. Wood platforms have largely given way to permanent materials. Depots at the more important stations have been replaced with brick and concrete. Wood coaling stations are a thing of the past, and frame enginehouses, shops, offices and a multitude of other buildings have been built or replaced with brick and steel. As a consequence, the need for large building forces no longer exists.

When it became necessary to reduce the forces at the outset of the depression, the reductions were so drastic that we could not have maintained our structures without the aid of power tools. At that time, too, we found it necessary to consolidate the gangs, using them indiscriminately on both

bridge and building work, and we have continued the practice to the present. Today, power tools practically dominate both bridge and building work, many of them being adapted equally for the two classes of work. We are finding this practice quite satisfactory, although we do find it desirable to retain a small but distinctive group of the more skilled building carpenters to do the more exacting jobs of interior repairs, and we expect to continue it. Conditions have changed so in recent years that I have revised my former views and am in full accord with present practices.

Putting in a Crossing

What preparatory work should precede the installation of a highway crossing at grade? Does the type of crossing make any difference? The character or density of the highway traffic? Why?

All Work Should Be New

By Julius M. Bischoff
Office Engineer, Terminal Railroad Association, St. Louis, Mo.

The installation of a highway crossing at grade calls for:

1. The removal of the existing ballast.
2. The installation of a deep, well-tamped and compacted bed of clean stone ballast.
3. The replacement of all crossties with new creosoted crossties, fully tie plated.
4. The installation of adequate and dependable drainage.
5. The replacement of the existing rails with new rails, provided they are available. The rails should be long enough, so that there will be no joints in the limits of the traveled highway, resorting to butt welding if necessary to accomplish this.

These requisites apply to most types of highway crossings, the exception being where the track is supported on a concrete foundation or where the ties are embedded in concrete. As highway traffic must, generally, be allowed to continue during the construction of the crossing, it should be inconvenienced as little as possible. For this reason, the preparatory work should be carried out with a force large enough to complete it during the period of lightest highway travel and, except when installing the new rails, one half of the crossing should be completed before the other is begun.

Put Track in Good Shape

By George M. O'Rourke
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

It is important to put the track in good shape but particularly so that this be done where the more permanent types of crossings are to be installed and where railway and highway traffic are heavy. Plank crossings with dirt or gravel approaches can be removed easily to permit repairs, but this is not true for other types. For this reason, the ties should be sound, the track should be lined and surfaced, new ballast should be installed and adequate drainage should be provided. It is still more difficult to remove and replace rail-asphalt crossings than metal or precast concrete slab crossings with asphalt or concrete approaches, so that for this type proper preparation is of great importance.

A suitable grade for the track and highway should be established to insure that the crossing will be drained. In this connection, it is desirable to establish a level grade on the street or highway for about 50 ft, on each side of the track, if vehicular traffic is heavy, to reduce to the minimum the impact of heavy trucks on the track. A good plan is to install 8-in. perforated corrugated iron pipe parallel with the track just outside the ties and a little below the ballast, extending to a good outlet. If there are two or more tracks, additional lines of pipe should be placed between tracks, with laterals to the outlet. Where possible, the track should be sealed at the crossing to prevent dirt, coal dust, sand and other substances from sifting into the ballast and fouling it, as well as to exclude moisture.

Before the crossing is installed, the track should be raised enough to get a good depth of ballast under the ties and approach grades on the track and highway, with easy gradients on the approaches. If the rail is not in first-class condition, new rail should be installed. If the crossing is on a section of track that is to be relaid with heavier rail in the near future, the heavier section should be laid through the crossing. New tie plates and fastenings should be installed and all joints should be butt welded.

It is desirable to divert all highway traffic during the construction of the crossing. If this cannot be done, one half of the crossing should be closed at a time. Wherever possible, it is a good plan to establish a temporary crossing which should be in operation sufficiently in advance to permit the ballast section and subgrade to obtain final settlement before the permanent material is installed. This will prevent settlement and the necessity for smoothing the track after the permanent crossing is in.

Providing Septic Tanks

Under what conditions and to what extent is it desirable to provide septic tanks at small stations? For company houses? What are the advantages? The disadvantages?

Is Quite Exceptional

By L. C. Winkelhaus
Architectural Engineer, Chicago & North Western, Chicago

The installation of septic tanks for small stations or other railway buildings is quite exceptional at present. Usually toilet facilities are not installed until municipalities construct water and sewer systems, when they are compelled to make use of them. Where a small outlying station is modernized, it is essential that sanitary facilities be provided. The necessary water may be taken from a locomotive water supply, or it may be necessary to construct a well and install a motorized pressure pump if there is no municipal water supply available. Many engine terminals and shops are outside city limits and cannot be reached by water lines or sewers, in which case septic tanks are desirable; in fact, they are compulsory in many states. If there is a running stream nearby, it is permissible to discharge the effluent into it.

It is essential that only the drainage from the toilets and urinals pass into the septic tank; wash water containing soap, grease, oil or similar matter must have a separate drainage sys-

tem, since it will nullify the bacterial activity needed to nitrify the organic wastes and thus destroy them.

Are Always Desirable

By A. L. Sparks
Architect, Missouri-Kansas-Texas, St. Louis, Mo.

Septic tanks are always desirable where sewers are not available, but in some cases it may not be expedient or economical to provide them, while in others they are a necessity. In still others where they are highly desirable, the need and justification for them have not asserted themselves. In some communities that are without sewers, privies located within 100 ft. of a well or cistern must have a water-tight vault protected from flies, a construction sometimes more costly than the septic tank.

The railways are sadly delinquent in their provisions for adequate toilet facilities, compared with their competitors. Even gasoline filling stations advertise free, clean and comfortable rest rooms for both men and women and their patrons seldom need to beg for the keys. It is doubtful whether station agents have any more sabotage to contend with in the maintenance of their facilities than filling station attendants. It is a rare exception, however, to find a modern, sanitary, well-lighted toilet room that will compare favorably with any one of two or three rest rooms within a few hundred feet of the station. Perhaps this is a contributing reason why some of the people patronize a competitor who caters to their instinct for cleanliness.

There may be some question about the desirability of company houses, but if they are provided there can be little question with respect to septic tanks for them, for men and women of responsibility look for respectable quarters. Some section foremen's houses have been occupied by Negro or Mexican laborers of late because more respectable quarters could be obtained by the foremen.

They Are Advantageous

By O. G. Wilbur
Field Engineer, Baltimore & Ohio, Baltimore, Md.

What should be done will depend in large measure on where the building is and the conditions surrounding it. If a sewer can be reached, it is obvious that sewage should be wasted into it. Where sewers are not available but soil and other conditions are satisfactory, and there is sufficient railway property available for the installation of either a tile disposal field or a leaching well, the use of the septic tank is decidedly advantageous. No difficulty is encountered in their operation, provided they have been designed and installed properly.

Septic tank installations have been used to advantage on piers and for water-front buildings where codes prohibit the discharge of raw sewage directly into the water, in which cases only the effluent is discharged. Drainage from septic tanks should never be led into fresh-water streams, and serious consideration must always be given to the relative location of points of tank discharges to sources of drinking water, as the effluent is impure, containing an enormous number of bacteria and, although almost all of the bacteria are removed by filtering-through the ground, drinking water sources must not be subjected to contamination from sewage.

In using septic-tank disposal equipment, it is important to consider soil conditions carefully. If the tank discharge cannot be piped to a waste-water ditch, the size of the tile disposal field will depend to a large extent upon the type of soil. Where heavy clay is encountered and ground absorption is poor, a more extensive tile-disposal field must be provided than would be required in a porous-ground area. Where a leaching well is considered instead of a tile-disposal field, unless the soil is reasonably porous, the well should not be used. It should be the last method of disposing of waste from a septic tank to be given consideration.

How Many Retightenings?

Where power bolt tighteners are employed in laying rail, how soon after the rail is laid should the bolts be retightened? How many follow-up tightenings should be made? Why? Should this be done by hand or with power machines? Why?

Danger of High Tension

By A. E. Perlman
Chief Engineer, Denver & Rio Grande Western, Denver, Colo.

When power bolt tighteners are employed in laying rail, a suitable device, such as an extensometer, should be used to check bolt tension periodically while the rails are being laid. If this is not done, it may result in excessively high bolt tensions, with subsequent stripping of threads, bolt or washer breakage, or in fatigue cracks originating in the joint bars. By using the extensometer, the power machine may be set for moderate tension, such as 15,000 to 20,000 lb. Frequent tests while the power tighteners are in use can result in uniformity of tension. If it is practicable to do so, a certain number of joints can be designated as reference joints and these can be used to determine how soon after the rail is laid that it is necessary to retighten the bolts. Whenever tests show that the tension has dropped to 6,000 or 8,000 lb., the bolts should be retightened. Follow-up tightening should be done as often as necessary to keep a moderately-uniform tension of 15,000 to 20,000 lb. Better operating and maintenance results are secured with uniform tension, with resultant reduction in failures and maintenance problems.

Retightening should preferably be done by hand, using a 24-in. wrench for 112-lb. rail and a 42-in. wrench for 131-lb. rail. By using reference bolts and extensometers, and spending a little time in tightening, loosening and retightening, the men can become acquainted with the amount of steady pull necessary to produce a given bolt tension. The danger with power wrenches is extremely high tensions. There is less chance that this will occur with hand wrenching, provided the correct length of wrench is used. Attention should also be directed to the fact that too low bolt tension can result in as many difficulties as too high tension. A moderate tension of from 15,000 to 20,000 lb. should be aimed for, and methods employed to insure that this objective is attained.

When Track Is Surfaced

By G. L. Sitton
Chief Engineer Maintenance of Way and Structures, Southern, Charlotte, N. C.

This is one of the many details of track maintenance that depends so largely on local conditions that it is impossible to give an answer that will fit all conditions. Whenever we lay new rail, we undertake to surface the track as soon as practicable thereafter. We try to get the surfacing

done within two weeks after the rail is laid, and we are generally able to do this by using two power tamping gangs where one outfit is not sufficient to finish the tamping of the stretch of new rail within this period. Occasionally some condition, such as a long-continued spell of freezing weather, prevents the completion of the surfacing within two weeks, but such occasions are rare. We retighten our bolts the first time just after the track is surfaced. We wait until this time because it is not advisable for the bolts to be too tight when the surfacing is in progress, especially in hot weather.

Local conditions — primarily the density and speed of traffic—determine how many follow-up tightenings should be made. We have some places where the first follow-up tightening is necessary in three or four months, while at the other extreme this does not become necessary for 12 to 18 months. Recently, we have started the use of finger-free track bolts and this makes it more necessary not to wait too long before the follow-up tightening is made. After the first follow-up, the intervals between subsequent tightenings depend on local conditions.

We believe that all bolts should be tightened with power machines because we believe that we are getting much more uniform bolt tension than we are by hand. Of course we know that the power machines will not give a perfect job with respect to uniformity, but they do not get tired as the day progresses, with the drop in tension there is in hand work during the latter part of the day.

Joint Bars Must Adjust

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Power bolt tighteners do or should bring all bolts on newly-laid rail to a uniform tension. If all of these bars could be brought to a perfect and precise fit when applied, there would be no occasion for follow-up tightenings after the rail is put in service. However, the bars may not be placed exactly the same between the two fishing surfaces of the rail, since they may not be set alike, the fishing surfaces may be rough or there may be some differences in the dimensions of individual rails or bars. Again, scale, rust, dirt or other foreign substances may cause imperfect fits.

In general, the bars will adjust themselves to the fishing surfaces with a fair degree of uniformity as the first train passes over them, but owing to the initial inequality of fit, they will not be equally loose and the bolts will not lose their tension equally. For these reasons, a power bolt tightener should be employed to follow up as soon as practicable to bring the bolts to a uniform tension again. There are too many variables in hand work to allow all bolts to get uniform tension when tightened with hand wrenches. Whether there should be three or more tightenings with power tighteners will depend on the fit of the bars after the original and follow-up tightenings. Usually, only a few bars are found to be loose after the original and first retightening and the bolts holding these bars can be taken care of by means of hand wrenches in the ordinary routine.

Should Piles Be Spliced?

Is it good practice to splice piles in a bent of a pile trestle? Why? If so, how many piles in the bent is it permissible to splice? How many bents may contain spliced piles?

Disapproves Lap Splices

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

If this question refers to lap splices, in which the pile is cut off far enough below the defect to assure sound wood and then two or three feet of the upper end of the stub is mortised to a similar length of the new pile, I do not consider it good practice. Certainly it is not economical, because of the labor and time involved. It requires both patience and skill to make a splice of this kind under the most favorable circumstances, and the conditions under which the work must be performed when splicing a pile in place are seldom favorable.

Furthermore, there is an added disadvantage in the necessity for rigging a scaffold from which the work must be performed. It should not be overlooked that a large percentage of the piles in use are full of knots, and that few of them are really straight. The latter makes it extremely difficult to get a perfect-fitting splice, and the former adds to the difficulty of framing.

Where lap splices are constructed at a height of 10 to 12 ft. above the ground line and at about the same distance under the cap, the joining points are seldom framed to fit perfectly. This gives the piles a tendency to buckle under load, and I have seen more than one case where the piles have split from this cause.

On the other hand, I do favor butt-joint splices, provided they are two or three feet below ground line, and the entire section of the pile above has been removed and a new post has been inserted on the pile stub and well secured to it by means of angle irons and bolts, two of which should be used to each splice. If the decayed part removed is only a few feet long and a square cut is made at each end of the remaining post, and the replaced section is fitted tightly and protected on both sides by plates 3-in. by 10-in. or 4-in. by 10-in., of sufficient length to project 3 ft. above and below the splices, which are secured by ¾-in. bolts, I see no objection, provided there are not more than two of them on the inside piles of a six-pile bent.

On the other hand, if the butt-joint splice is made two or three feet below the ground line and is anchored by means of angles, the bent should have sufficient strength to render satisfactory service by removing and repairing in this manner three inside piles of a six-pile bent. It has been my experience that it is practically impossible to find piles, whether treated or untreated, that will have the same service life. For this reason, to obtain the full service life of those parts of the structure that will last the longest, it is always safe and economical to replace decayed or otherwise failed piles with posts, which should be secured thoroughly by anchoring and bracing, provided there are not more than three such piles to a bent, all of which should be inside piles or alternating piles.

Three good piles in any bent, if they are spaced properly, and three posts that are well anchored and well braced to the piles, are superior with respect to stiffness than frame bents. If the replacement has been well done, they will also require less maintenance. However, if two or more piles fail directly under the cap, and the failure does not extend more than 12 in. below the cap, all piles should be cut off and the bent should be double capped.

If not more than three piles to the bent have been repaired in this manner, every bent in the trestle may contain spliced piles, with the assurance

that the structure will give satisfactory service. However, if there are only four piles to a bent, such trestles usually being on branch lines, and two have failed, the bent should be redriven or framed bents should be erected. In general, the number of piles that may be spliced will be determined by the type of trestle, the class of the line upon which the structure is located, the character and volume of traffic, the speed of trains and the alinement of the bridge.

No Objection to Splicing

By General Inspector of Bridges

There should be no objection to splicing piles, provided the work is well done and the joint is well secured by means of bolts and fishing plates or scabs, as they are sometimes called, except that a splice should not be made in a pile that is badly warped, naturally crooked or that has deep seasoning splits. It would have been better not to have driven the crooked pile in the first place.

If the defect in the pile is at the top, it will probably be better to cut it down only enough to reach sound wood and then insert a corbel under the cap. The corbel can also be extended to cover two adjacent piles, but if more than two need attention, it will be better to cut down all piles in the bent and double-cap it.

In a six-pile bent, not more than three piles should be spliced under any circumstances. If they are inside piles they may be adjacent; if outside piles are involved, the spliced piles should alternate with sound, unspliced piles. In a four-pile bent, not more than two piles should be spliced. When piles are spliced, special attention should be given to applying the fishing so that the splice will be secure and stiff, with no relative movement between the parts. If this has been done and the abutting faces are fitted correctly, I see no reason for any limitation on the number of bents that may contain spliced piles.

Doubling Section Gangs

Where section gangs are small, to what extent is it desirable to double them up to do lining and other work? What are the advantages and disadvantages?

Should Be Restricted

By W. L. Roller
Division Engineer, Chesapeake & Ohio, Columbus, Ohio

This is a practice that should be restricted as much as possible and when done should be confined to items of an emergency nature, where other forces or equipment are not available or where the force must be supplemented quickly to expedite work upon which work trains are employed. Certain items, however, such as unloading cross and switch ties, can usually be performed better by doubling up the forces. The handling of long, heavy switch ties requires more men than are in the average section gang, so that, to provide enough men to avoid extending the period of work-train service, it is advisable to combine the small gangs for such work.

The objections to merging small forces too frequently, generally with little or no planning, are obvious. The practice should be policed and allowed only under the closest supervision. Some of the many objections follow:

1. It defeats proper supervision by dividing responsibility between foremen. Unless there is a specific understanding in advance with respect to responsibility for the immediate direction of the work, confusion is apt to ensue, resulting sometimes in no supervision at all.

2. This lack of complete definition of responsibility often results in improper co-ordination of the work being done and increases the probability of accident.

3. The merging also results in waste of supervision, since only one man is needed to direct the combined force.

4. It does not work out very well to make a practice of taking a man from the territory which he has learned to consider as his own definite responsibility for maintenance.

5. Bitter experience has also shown that where this practice is followed without very careful supervision, there is apt to be confusion of understanding and instructions with reference to the prosecution of the work, the operation of motor cars, etc., which does not occur when the forces are kept within their own jurisdictions.

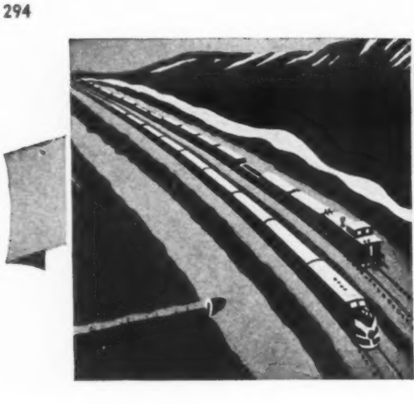
I do not disapprove the practice entirely, for I recognize that many items of work which might be considered as jobs for larger outfits, can be handled acceptably by a small gang that is equipped properly. For instance, lining, which is referred to in the question, can often be done by a foreman and two or three men equipped with track liners. The same is true of other items which can be done cheaply and as well by the resident gangs, with a little planning. As a whole, however, I should say that if gangs have grown so small as to be unable to perform items of necessary work, it is time to redistrict the territory by extending the sections, combining the forces and reducing the overhead cost of supervision. In any event, while the practice of combining section gangs may be necessary at times, it is one that should be permitted only under special authority and special supervision.

Is Economically Unsound

By G. Stafford
Section Foreman, Canadian National, Redland, Alta.

This is a practice that is unsound economically, for the ratio of productive to total time is greatly reduced by the time spent in traveling to and from work. An arrangement of this kind is seldom reciprocal and the favoring of one section to the detriment of the others is not only wasteful economically, but it is injurious to the morale of the organization. Lining is mentioned specifically as an operation where the practice might be desirable. Assume, therefore, that spot surfacing has been in progress and to complete the job it is necessary to line the track. Ordinarily a force large enough to do the surfacing should be able to line the track. If it is not, supplying the gang with track liners will be more economical than bringing in the gangs from adjoining sections.

In this north country the practice finds little favor, for the active working season is so short that only a few interruptions will disrupt the program for the entire season. Furthermore, the foreman who is compelled to give the service is disgruntled, while the receiver is inclined to consider that the necessity for accepting it is a reflection on his ability. On the other hand, it should be obvious that occasions will arise in which the practice can be fully justified. In times of emergency, such as derailments, fires, floods, etc., a track foreman should not wait for orders but should, on his own initiative, proceed to the scene and render such assistance as is in his power. There are other occasions when considerable delay to trains can be eliminated by doubling up gangs to unload ties, cinders or other materials.



NEWS of the Month

S. P. Shasta Line Put in Operation

On March 15, the 30-mile, single-track Shasta line change of the Southern Pacific in northern California, was placed in service. This project, begun in September, 1938, and caried forward under the direction of the Federal Bureau of Reclamation, has been one of the most outstanding railway projects undertaken in the United States in many years. It involved 12 tunnels, with an aggregate length of 19,070 ft.; 8 major bridges, with a combined length of 13,044 ft; and approximately 5,780,000 cu. yd. of grading. The large interests of the Southern Pacific in this project have been in the hands of W. H. Kirkbride, chief engineer, and G. A. Given, location division engineer.

One Billion for 1942 Construction and Maintenance

Although expenditures for both railway construction and maintenance in 1941 were higher than any year for more than a decade, the railways plan to make still further increases in these expenditures in 1942, according to an article in the March 14 issue of Railway Age, which estimates that aggregate expenditures for railroad construction this year will rise to $400,000,000. Maintenance expenditures are expected to total $700,000,000 in 1942 or substantially the same as in 1930, a figure that has not even been approached since that year. Expenditures for maintenance of way and structures in January, 1942, amounted to $94,439,135, the highest for any January since 1930, and compared with $74,219,856 in January, 1941, a gain of $20,219,279, or 27.2 per cent.

Pennsylvania Safety Contest

In the sixteenth annual employee safety contest of the Pennsylvania Railroad system for 1941, the New York Zone won first place among the major regional units of the railroad, by making the best general showing in all departments during that year, with a record of 7.96 accidents per million man-hours of work. Among the general divisions of the railroad, the winner in 1941 was the Lake division, with headquarters at Cleveland, Ohio, which had 8.13 accidents per million man-hours of work. Among the superintendents' divisions, the winner in Group A, comprising the largest divisions, was the Long Island Railroad, in Group B, the Panhandle division, and in Group C, the Delmarva division.

In the departmental contests, the winners by superintendents' divisions in the maintenance of way department were: Group A, Philadelphia Terminal division, Philadelphia, Pa.; Group B, Fort Wayne division, Fort Wayne, Ind.; and Group C, Monongahela division, Pittsburgh, Pa.

The purpose of the annual safety contests is to promote safety among employees by stimulating healthy rivalry in making the best records for accident prevention. Comparative results for the various divisions are posted monthly on employee bulletin boards throughout the system.

No Steel for Pipe Line

The War Production Board has again turned down Petroleum Coordinator Harold L. Ickes on his proposal to build a 24-in. crude oil pipe line from the East Texas fields to the refining area adjacent to New York City. Mr. Ickes recently renewed his plea for priorities for steel pipe for the line, in view of the oil situation on the east coast due to tanker sinkings. The project had been turned down twice previously by the WPB's predecessor, the Supply Priorities and Allocations Board.

Freight Rate Increases Granted—Placed in Effect

On March 18 increased freight rates and charges calculated to yield the railroads approximately $203,000,000 additional revenue annually were placed in effect. The increases, authorized by the Interstate Commerce Commission in a report which was made public on March 2, are six per cent on all commodities, except on certain basic or raw commodities and on coal, coke and iron ore. The increases approved on basic or raw commodities, which include products of agriculture, livestock and products and low grade products of mines, were three per cent. On anthracite and bituminous coal, coke of all kinds and lignite, specific increases were allowed, depending upon the existing rate. No increase was approved on iron ore.

Industry Branch Set-up Reorganized

A separate industry branch for transportation, formerly in the Transportation and Farm Equipment Branch, has been created by the War Production Board in a reorganization of the Bureau of Industry Branches of the Division of Industry Operations. Andrew Stevenson, formerly chief of the Transportation and Farm Equipment Branch, has been named chief of the Transportation Branch.

The reorganization increases the number of branches from 14 to 24. At the same time Philip D. Reed, chief of the Bureau of Industrial Branches, issued an order defining the powers and duties of branch chiefs. "The main task of the branch chief will be to bring about maximum use of existing industrial capacity within the industry assigned to him for the production of war material and products for essential civilian use. He will assist the industry assigned to him in every phase of its production program, including conversion, financing of new and expanded facilities, problems of labor supply, and procurement of materials and equipment."

Higher Ratings for Repair and Maintenance Materials

Higher preference ratings for railroad maintenance materials and operating supplies and improved procedures in connection therewith have been provided by the War Production Board in Preference Rating Order No. P-88, issued March 17 by J. S. Knowlson, director of the Division of Industry Operations. These higher ratings provide:

1. A new A-1-a rating for delivery of materials needed for emergency repairs upon specific approval of the War Production Board.
2. A rating on deliveries of raw materials, with the quantity and the rating to be determined upon a quarterly basis by the War Production Board Director of Industry Operations.
3. An A-3 rating (raised from A-10) on materials to be used for maintenance or repair of passenger cars, rail, track fastenings, turnouts, crossings, bridges, float bridges, turntables, signals, interlockings, centralized traffic control systems, coal and ore handling and conveying machinery, freight handling and warehousing equipment, floating equipment, wreck equipment, maintenance of way work equipment, telephone and telegraph systems, water and fueling plants, car retarders, scales, power plants, transmission systems, and shop tools and equipment.
4. An A-8 rating (raised from A-10) on deliveries to railroads of other material necessary for maintenance, repair or operating supplies.

Each railroad may start operating under P-88 as soon as it has filed with WPB, on Form PD-352, a statement showing its present inventories of repair and maintenance supplies. And thereafter the plan will be controlled by quarterly inventory statements submitted to WPB.

Personal Mention

General

F. A. Burroughs, Jr., track supervisor on the Southern at Pell City, Ala., has been appointed assistant trainmaster at Somerset, Ky.

William H. Jones, roadmaster on the Atchison, Topeka & Santa Fe at Chillicothe, Ill., has been appointed acting trainmaster at La Junta, Colo.

H. L. Bell, division engineer of the Victoria division of the Southern Pacific Lines in Texas and Louisiana, with headquarters at Victoria, Tex., has been promoted to assistant superintendent of that division, with the same headquarters.

Albert Henry Woerner, division engineer on the Baltimore & Ohio at Garrett, Ind., has been promoted to superintendent of the newly-created Indianapolis division of the Baltimore & Ohio, with headquarters at Indianapolis, Ind.

John D. Morris, whose promotion to superintendent of the Wilkes-Barre division of the Pennsylvania was reported in the February issue, was born at Sykesville, Md., on December 7, 1905. He was graduated from the College of Engineering of the University of Maryland in 1926 and entered the service of the Pennsylvania shortly thereafter as a rodman on the Pittsburgh division. The following year he became assistant track supervisor, in which capacity he served successively at Hollidaysburg, Pa., Jersey City, N. J., Downingtown, Pa., and Tyrone. Mr. Morris was advanced to supervisor on April 10, 1929, serving at Harrington, Del., Lock Haven, Pa., Tyrone, Newport and Philadelphia, successively, until February 21, 1938, when he was promoted to

John D. Morris

division engineer of the Monongahela division at Pittsburgh. On November 1, 1938, he was transferred to the Renovo division and on April 1, 1939, he became division engineer of the Philadelphia Terminal division, which position he held until his recent promotion.

John G. Brennan, formerly with the Association of American Railroads at Washington, D. C., and an engineer by training and experience, has been appointed assistant to vice-president of the New York Central system, with headquarters at Washington, and will be assigned to special duties. Mr. Brennan was born at Syracuse, N. Y., and educated at Syracuse University. He entered railroad service on April 23, 1906, as a chainman in the maintenance of way department of the New York Central at Buffalo, N. Y., and in June, 1907, he was transferred to the engineering department as a rodman on grade revision on the West Shore west of Syracuse. Mr. Brennan then served successively as transitman in charge of a grade crossing elimination, draftsman and assistant engineer on various construction jobs on grade revision and third tracking, and resident engineer on the Tonawanda change of line in connection with the elimination of grade crossings. He was appointed assistant district engineer of the Western district, with headquarters at Buffalo, on January 1, 1920, and assistant engineer in charge of construction of the Middle district, with

John G. Brennan

headquarters at Albany on June 1, 1922. Mr. Brennan became engineer of grade crossings, Buffalo and East, on October 1, 1924, at New York, holding that position until May 1, 1935, when he was transferred on deputed service to the Association of American Railroads, with headquarters at Washington, D. C., becoming engineer of grade crossings of that association and secretary of the National Committee on Grade Crossing Elimination. Mr. Brennan returned to the service of the New York Central system on January 16, 1942, as assistant to vice-president and will continue to act as secretary of the A. A. R. Committee on Grade Crossing Elimination and contact representative with the Public Roads Administration.

C. J. Henry, whose promotion to superintendent of the Toledo division of the Pennsylvania, with headquarters at Toledo, Ohio, was reported in the February issue, was born in Youngsville, Pa., on December 1, 1900, and graduated from the University of Cincinnati. He first entered the service of the Pennsylvania in the maintenance of way department of the Renovo division on May 19, 1919, and became an assistant on the engineer corps in 1923. He was promoted to assistant supervisor of track on the Long Island Railroad (a subsidiary of the Pennsylvania) in 1926, and was transferred to the Eastern division of the Pennsylvania in 1928. Mr. Henry was advanced to

C. J. Henry

supervisor of track in 1929 and served on the Allegheny, Buffalo, Erie & Ashtabula, Pittsburgh and Philadelphia Terminal divisions until January 1, 1934, when he was promoted to division engineer in the general office at Philadelphia, Pa. On November 16, 1934, he was transferred to the Buffalo division and on July 1, 1937, he was transferred to the Pan Handle division, with headquarters at Pittsburgh, Pa., where he was located until his recent promotion to superintendent.

Engineering

L. E. Lyons has been appointed to the newly created position of second assistant division engineer on the Western division of the Southern Pacific.

William R. Judd has been appointed engineering geologist for the Denver & Rio Grande Western, a newly created position, with headquarters at Denver, Colo.

Clyde Parker Nicholson, engineer maintenance of way and structures of the Norfolk Southern, has been promoted to assistant chief engineer, with headquarters as before at Norfolk, Va.

J. P. Dunnagan has been appointed engineer of bridges, Southern Pacific, Pacific lines, with headquarters at San Francisco, Cal., succeeding **George W. Rear,** whose death on February 10 was reported in the March issue.

C. N. Billings, supervisor of bridges and buildings on the Southern Pacific Lines in Texas and Louisiana at Ennis, Tex., has been promoted to division engineer of the Victoria division, with headquarters at Victoria, Tex., succeeding **H. L. Bell,** whose promotion to assistant superintendent is reported elsewhere in these columns.

E. H. Barnhart, general bridge inspector of the Western lines of the Baltimore & Ohio, has been promoted to division engineer at Garrett, Ind., succeeding **Albert Henry Woerner,** whose promotion to superintendent at Indianapolis, Ind., is reported elsewhere in these columns. **Howard F. Passel,** assistant division engineer at Indianapolis, has been promoted to division engineer

of the newly created Indianapolis division, with the same headquarters.

D. E. Woozley, chief engineer of the Union railroad, with headquarters at East Pittsburgh, Pa., has been appointed consulting engineer, with headquarters at Pittsburgh. **H. A. Sayre,** principal assistant engineer, has been promoted to chief engineer. **A. J. Wilson,** supervisor of general maintenance, has been promoted to general maintenance engineer.

H. W. Tooker, draftsman on the Canadian National at Calgary, Alta., has been promoted to acting division engineer at Calgary, succeeding **A. J. Gayfer,** who has retired after 43 years of railway service.

Mr. Tooker was born at Pembrokeshire, Wales, on June 12, 1886, and entered Canadian National service on April 10, 1912, as a rodman at Prince Rupert, B. C., later serving as instrumentman at Prince Rupert and Calgary and draftsman at Calgary. From October, 1915, to May, 1919, he was in military service overseas.

H. T. Livingston, engineer of bridges in charge of bridge maintenance and construction of the Chicago, Rock Island & Pacific, has been appointed engineer of bridges in charge of bridge design, construction and maintenance, with headquarters as before at Chicago, succeeding to the duties of **I. L. Simmons,** bridge engineer in charge of design and contracts, whose retirement on March 1 was reported in the March issue. **H. Bober,** assistant engineer at Chicago, has been promoted to assistant engineer of bridges, with the same headquarters, and **S. T. Corey,** assistant engineer of bridges, has been appointed office engineer.

Glen H. Trout, whose promotion to assistant chief engineer of the Union Pacific, with headquarters at Omaha, Neb., was reported in the March issue, was born at Basil, Ohio, on November 16, 1879, and graduated in civil engineering from the University of Washington in 1902. In July, 1902, he became a draftsman for the American Bridge Company and in March,

Glen H. Trout

1903, he went with the Phoenix Bridge Company, Phoenixville, Pa., as a draftsman and foreman. Seven months later, he entered railway service as assistant engineer, bridges and structures, on the Oregon Short Line (now part of the Union Pacific) at Pocatello, Idaho, and later served as assistant engineer on all divisions of the O.S.L. In 1912, Mr. Trout was promoted to bridge engineer of the O.S.L. and during the first World War he served as works manager of the Chester Shipbuilding Company, Chester, Pa. He returned to railroad service in January, 1920, as bridge engineer of the Union Pacific system.

Raymond C. Lowrey, whose appointment as resident engineer of the Missouri & Arkansas, with headquarters at Harrison, Ark., was reported in the February issue, was born at Paradise, Tex., on November 16, 1901, and entered railway service on January 1, 1920, as a chainman on the Ft. Worth & Denver City at Ft. Worth, Tex., later serving as a rodman and instrumentman at that point. On October 13, 1924, he went with the Chicago, Rock Island & Pacific, serving successively as an instrumentman and rodman at Ft. Worth, masonry inspector at Park Springs, Tex., and instrumentman, building inspector, assistant engineer, instrumentman and rodman at Ft. Worth. On October 1, 1931, he was transferred as a rodman to Kansas City, Mo., and from

Raymond C. Lowrey

February 1, 1932, to January 1, 1933, he engaged in private engineering work. Mr. Lowrey returned to the Rock Island on the latter date as a track supervisor at El Reno, Okla., and on May 27, 1940, he was transferred to Hazen, Ark., where he remained until his recent appointment, effective December 16.

Harold F. Tupper, assistant division engineer on the New Hampshire division of the Boston & Maine, with headquarters at Concord, N. H., has been appointed acting engineer of track, effective March 16, with headquarters at Boston, Mass., to succeed **Henry C. Archibald,** who has been promoted to assistant to the chief engineer, with headquarters at Boston. **Harold S. Ashley,** acting division engineer on the Portland division, with headquarters at Dover, N. H., has been promoted to division engineer, effective March 16, at the same headquarters. **Francis T. Flynn** has been appointed assistant division engineer on the Terminal division, with headquarters at Boston, Mass., effective March 16, to succeed **Harold W. Legro,** who has been appointed engineer of grade crossings, with headquarters at Boston. **John P. Cronin,** office engineer at Boston, Mass., has been appointed engineer of design, and is succeeded by **Frank W. Harper.**

Oscar C. Benson, track supervisor, with headquarters at Lawrence, Mass., has been promoted to acting assistant division engineer, with headquarters at Concord, N. H. **John A. Kerig,** assistant bridge and building supervisor, with headquarters at Boston, Mass., has been appointed assistant engineer, with the same headquarters. **John F. Reilly,** acting assistant division engineer on the Fitchburg division, with headquarters at Greenfield, Mass., has been promoted to assistant division engineer at the same headquarters.

George T. Donahue, assistant engineer on the New York Central, has been promoted, effective April 1, to division engineer of the Western and West divisions, with headquarters at Chicago, succeeding **George H. Smith,** who has been transferred to the Ohio Central division, with headquarters at Columbus, Ohio. Mr. Smith relieves **C. V. Bucher,** who has been transferred to the Lines Buffalo and East. Effective the same date **J. R. Scofield,** supervisor of track at Columbus, Ohio, was appointed assistant engineer in the office of the district engineer at Cleveland, Ohio, to replace **J. L. Cox,** who was transferred to the Lines Buffalo and East. Effective May 1, **R. R. Smith,** division engineer at Jersey Shore, Pa., will be transferred to the Toledo division, with headquarters at Toledo, Ohio, to succeed **J. M. Podmore,** who will retire on April 30.

H. G. Carter, division engineer of the Columbus division of the Central of Georgia, has been promoted to the newly created position of engineer of maintenance of way, with headquarters at Savannah, Ga. **W. E. Chapman,** supervisor of track on the Americus and Greenville districts, at Columbus, Ga., has been appointed division engineer, succeeding Mr. Carter.

Mr. Carter was born on January 24, 1892, and attended the Georgia School of

H. G. Carter

Technology, Atlanta, Ga., and the Alabama Polytechnic Institute, Auburn, Ala., graduating in civil engineering from the latter institution in 1914. He entered the service of the Central of Georgia in the office of the chief engineer at Savannah in

January, 1918, and in October, 1918, he was appointed assistant engineer on the Columbus division, three months later being transferred to the Southwestern division. In January, 1925, Mr. Carter was promoted to division engineer of the Southwestern division, with headquarters at Macon, Ga., and in October, 1931, he was transferred to the Columbus division, with headquarters at Columbus, Ga., where he was located until his recent promotion, effective March 1.

Mr. Chapman served in the United States Army from June, 1916, to February, 1919. He then attended Alabama Polytechnic Institute, graduating in civil engineering in June, 1924, and after graduation served with the Alabama Highway Department and became county engineer for Coosa County, Ala. On February 15, 1925, he entered railway service in the engineering department of the Central of Georgia at Savannah, later serving as assistant and acting supervisor of track on the Savannah division. On September 1, 1936, he was appointed supervisor of

W. E. Chapman

track at Union Springs, Ala., and on June 1, 1939, he was transferred to Columbus, Ga., where he remained until his recent promotion.

John E. Fanning, division engineer on the Illinois Central at Waterloo, Iowa, has been promoted to assistant to the chief engineer, a newly created position, with headquarters at Chicago. **N. R. Hill,** supervisor of bridges and buildings at Waterloo, has been promoted to division engineer, with the same headquarters and with jurisdiction from MP W-15 on the Chicago-Freeport line to the west switch at Waterloo. **T. M. Pittman,** division engineer of the Mississippi division at Water Valley, Miss., has been transferred to Waterloo, with jurisdiction over the lines west of Waterloo. **Paul H. Croft,** acting division engineer at Clinton, Ill., has been advanced to division engineer at Water Valley, relieving Mr. Pittman.

Mr. Fanning was born at Buena Vista, Miss., on August 13, 1885, and graduated from the University of Mississippi in 1905. He entered railway service in 1905 as an instrumentman on the Gulf & Ship Island (now part of the Illinois Central) at Gulfport, Miss., and was later advanced successively to assistant engineer, supervisor of track and assistant to the chief engineer. In 1917 he was appointed resident engineer on construction for the Illinois Central at Chicago and in 1919 he returned to the Gulf & Ship Island and the Mississippi Central as chief engineer.

John E. Fanning

He returned to the Illinois Central, following the termination of federal control of the railroads, as assistant engineer on construction at Chicago and in 1921 he was appointed roadmaster at Ft. Dodge, Iowa. Mr. Fanning was advanced to district engineer of the Western lines, with headquarters at Waterloo, Iowa, on January 1, 1923, and on March 1, 1929, he was transferred to the Southern lines, with headquarters at New Orleans, La. On November 1, 1931, he was appointed supervisor of track at Waterloo and on January 1, 1937, he was appointed assistant engineer on the Iowa division. Mr. Fanning was promoted to division engineer of that division, with headquarters at Waterloo, on February 15, 1938.

Track

L. R. Deavers, on the Missouri-Kansas-Texas at Smithville, Tex., has been promoted to roadmaster, with headquarters at Cisco, Tex., succeeding **B. C. Metcalf,** deceased.

J. C. Hill, general roadmaster of the Green Bay & Western, has been appointed superintendent of track maintenance, with headquarters as before at Green Bay, Wis., a change of title.

J. C. Houston, assistant supervisor of track on the New York Central (Michigan Central) at Kalamazoo, Mich., has been promoted to supervisor of track at Columbus, Ohio, succeeding **J. R. Scofield,** whose appointment as assistant engineer at Cleveland, Ohio, is reported elsewhere in these columns.

M. C. Chitty, rail welder on the Savannah division of the Central of Georgia, has been promoted to supervisor of track at Albany, Ga., succeeding **R. E. Sease,** who has been transferred to Columbus, Ga., replacing **W. E. Chapman,** whose promotion to division engineer of the Columbus division is reported elsewhere in these columns.

James D. Sullens, assistant to the roadmaster on the Southern at Somerset, Ky., has been promoted to track supervisor at Pell City, Ala., succeeding **F. A. Burroughs, Jr.,** whose appointment as assistant trainmaster at Somerset is reported elsewhere in these columns. **J. W. Sanders,** section and extra gang foreman at New Orleans, La., has been advanced to assistant to the roadmaster at Somerset, relieving Mr. Sullens.

Walter C. Peters, track supervisor on the Atchison, Topeka & Santa Fe at Newton, Kan., has been promoted to roadmaster at that point, succeeding **V. I. Kessinger,** who has entered military service. **C. L. Conley,** track supervisor at Lamar, Colo., has been advanced to roadmaster at La Junta, Colo., relieving **N. D. Bloom,** promoted. **F. E. Bonner,** track supervisor at Littleton, Colo., has been promoted to assistant roadmaster at Pueblo, Colo.

A. S. Deaner, assistant supervisor of track on the Maryland division of the Pennsylvania, has been promoted to supervisor of track at Toledo, Ohio, succeeding **H. J. Lattomus,** who has been transferred to the Williamsport division. **J. E. Chubb,** assistant supervisor of track on the Pennsylvania at West Philadelphia, Pa., has been promoted to supervisor of track at Cincinnati, Ohio, succeeding **W. R. Garner,** who has been transferred to Terre Haute, Ind., replacing **J. F. Piper,** who has been called for military service. **J. W. Cozzens,** assistant on the engineer corps, Western region, has been promoted to assistant supervisor of track at Columbus, Ohio.

Robert T. Spaulding, assistant track supervisor on the Boston & Maine, with headquarters at Rochester, N.H., has been promoted to acting track supervisor on the Portland division, effective March 16, with headquarters at Lawrence, Mass., to succeed **Oscar C. Benson,** whose appointment to acting assistant division engineer is noted elsewhere in these columns. **Frederick G. Baker, Jr.,** has been appointed acting track supervisor on the Portland division, with headquarters at Portsmouth, N.H., effective March 16. **Vivian D. Braley** has been appointed assistant track supervisor of district No. 1 of the New Hampshire division, with headquarters at Concord, N.H., effective March 16, to succeed **Arthur A. McMullen,** who has been appointed track supervisor, also with headquarters at Concord. **Whitcomb Haynes** has been appointed track supervisor of district No. 3 of the same division, with headquarters at Concord, N.H.

On the Fitchburg division, effective March 16, **John F. Malloy** has been appointed track supervisor of district No. 2, and **Frank H. Mason,** acting track supervisor, has been promoted to track supervisor of district No. 4, both appointments with headquarters at Greenfield, Mass.

John Frank Wilkinson, whose promotion to supervisor of track on the Illinois Central, with headquarters at Jackson, Tenn., was reported in the February issue, was born at Bolivar, Tenn., on October 25, 1895, and entered railway service on April 11, 1911, as a section laborer on the Illinois Central at Middleburg, Tenn. On May 12, 1912, he was promoted to section foreman and served in that capacity successively at Middleburg, Bolivar, Horn Lake, Miss., and again at Bolivar, until his recent promotion.

Clay J. Webb, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Union City, Ind., was reported in the January issue, was born in Pine township, Columbia county, Pa., on March 18, 1898, and entered railway service on May 27, 1919, as a trackman on the Pennsylvania. From July, 1919, to November, 1920, he served as assistant foreman of track at Berwick, Pa., and Milton, Pa., and on the latter date he was advanced to foreman of track, serving at various points on the Williamsport division until January 8, 1929, when he was promoted to general foreman at Perrysville, Md. On April 7, 1929, Mr. Webb was promoted to assistant supervisor of track at Media, Pa., and two years later he was transferred to Millersburg, Pa. In May, 1932, he was appointed foreman of track at Millersburg and a year later he was appointed general foreman of the arc welding unit, Eastern region. In November, 1936, Mr. Webb was appointed assistant supervisor of track on the rail laying train, Eastern region, which position he held until his recent promotion, effective December 16.

John Frank Watts, whose retirement as track supervisor on the Illinois Central, with headquarters at Water Valley, Miss., was reported in the February issue, was born at Rockport, Miss., on December 12, 1871, and entered railway service on January 1, 1892, as a section laborer on the Illinois Central at Ponchatoula, La. He was promoted to section foreman at Hammond, La., in April, 1893, and from February, 1899, to November, 1899, served as foreman of an extra gang on construction at Harahan, La., and McComb, Miss. On the latter date, Mr. Watts was promoted to supervisor of construction on the Yazoo & Mississippi Valley (now part of the Illinois Central system), later returning to the McComb district of the Louisiana division of the I. C. as an extra gang foreman. In October, 1910, he was promoted to supervisor of track of the New Orleans (La.) terminal and in 1913 he was promoted to roadmaster of the Louisiana division, with headquarters at New Orleans. Mr. Watts was appointed supervisor of track on the Mississippi division, with headquarters at Grand Junction, Tenn., in 1915 and in 1932 his office was transferred to Water Valley, where he remained until his retirement.

Donald John Martin, whose promotion to roadmaster on the Canadian Pacific, with headquarters at Yorkton, Sask., was reported in the February issue, was born at Moose Jaw, Sask., on July 13, 1912, and graduated in civil engineering from the University of Manitoba in 1935. He first entered railway service during the summer of 1929 as a chainman on the Canadian Pacific at Kenora, Ont., and in 1930, 1933 and 1934, during vacations from school, served as a chainman and rodman at Kenora and as a section and extra gang laborer at Winnipeg. In May, 1935, he was appointed a transitman at Calgary, Alta., later being transferred successively to Edmonton, Alta., Revelstoke, B.C., and Vancouver. In October, 1941, Mr. Martin was appointed relieving roadmaster at Victoria, B.C., later being transferred to Vancouver, where he was located at the time of his promotion, effective December 1.

C. R. Merriman, assistant supervisor of track on the Pennsylvania, who has been promoted to supervisor of track, with headquarters at Carnegie, Pa., as reported in the February issue, was born on February 24, 1912, at Valparaiso, Ind. Mr. Merriman obtained his higher education at Rose Polytechnic Institute, graduating with the class of 1936. He entered railway service with the Pennsylvania on February 4, 1937, as an engineer apprentice, serving in this capacity on the Logansport and Cincinnati divisions. Subsequently, he was appointed an assistant on the engineer corps, in which capacity he served at various locations. On September 23, 1940, Mr. Merriman was advanced to assistant supervisor of track, with headquarters at Steubenville, Ohio, which position he held until his recent promotion to supervisor of track, which became effective on January 16.

William H. Armstrong, whose retirement on December 31 as roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Aberdeen, S.D., was reported in the February issue, was born at Ponca, Neb., on August 3, 1875, and entered railway service on August 19, 1894, as a section laborer on the Milwaukee at Sturgis, Mo., later transferring to Morley, Iowa. In 1903 he was promoted to section foreman at Paralta, Iowa, later being transferred to Perry, Iowa, and Rhodes. From 1907 to 1918, Mr. Armstrong served as section foreman and extra gang foreman at Madrid, Iowa, and Perry, and on the latter date he was advanced to roadmaster in charge of the Milwaukee (Wis.) terminals, later being transferred successively to Horicon, Wis., Beloit, Wis., Perry, Janesville, Wis., and Aberdeen, S.D.

Carl F. Brooks, whose promotion to track supervisor on the Illinois Central, with headquarters at LaSalle, Ill., was reported in the February issue of *Railway Engineering and Maintenance*, was born at Lafayette, Tenn., on May 11, 1893, and entered railway service on September 4, 1921, as a section laborer on the Illinois Central at Glenarm, Ill. On May 20, 1925, he was promoted to assistant section foreman and on October 1, 1926, he was advanced to section foreman. Mr. Brooks was promoted to extra gang foreman on September 1, 1930, and from October 1, 1936, to January 1, 1942, he served as a section foreman or assistant supervisor of track on the Springfield division. His promotion was effective on the latter date.

Bridge and Building

Jacob S. Andrews has been appointed assistant supervisor of bridges and buildings of the Terminal division of the Boston & Maine, effective March 16, with headquarters at Boston, Mass., to succeed **John A. Kerig,** whose appointment to assistant engineer is noted elsewhere in these pages.

J. B. Singleton, assistant supervisor of bridges and buildings on the Southern at Birmingham, Ala., has been promoted to supervisor of bridges and buildings on the St. Louis-Louisville division, with headquarters at Louisville, Ky., succeeding **J. R. Kelly,** who has been appointed assistant supervisor of bridges and buildings at Birmingham, relieving Mr. Singleton.

A. P. Reese, assistant supervisor of bridges and buildings on the Southern Pacific Lines in Texas and Louisiana at Ennis, Tex., has been promoted to supervisor of bridges and buildings, with the same headquarters, succeeding **C. N. Billings,** whose promotion to division engineer at Victoria, Tex., is reported elsewhere in these columns.

M. C. Morphew, general foreman of bridges and buildings on the Illinois Central at Waterloo, Iowa, has been promoted to supervisor of bridges and buildings, with the same headquarters, and with jurisdiction from MP W-15 on the Chicago-Freeport district to the West switch at Waterloo. **J. E. Sallis,** building inspector at Chicago, has been appointed supervisor of bridges and buildings at Waterloo, with jurisdiction on the lines west of Waterloo.

Malcolm A. Beringer, whose promotion to bridge inspector of the Northern lines of the Illinois Central, with headquarters at Chicago, was reported in the February issue of *Railway Engineering and Maintenance*, was born at Unionville, Pa., on December 11, 1901, and attended Pennsylvania State college in 1917 and 1918 and took night school courses at Louisiana State University in 1923 and 1924. He first entered railway service during the summers of 1917 and 1918 as a clerk on the Pennsylvania at Tyrone, Pa. During the summer of 1920, he worked in the maintenance of way department of the Chicago, Milwaukee, St. Paul & Pacific and in September, 1920, he became a bridge and building helper on the El Paso division of the Southern Pacific. On February 3, 1921, he went with the Illinois Central as a bridge and building helper on the Vicksburg division and on June 6, 1923, he was promoted to assistant bridge and building foreman. Mr. Beringer was advanced to bridge and building foreman on October 27, 1924, and on September 9, 1940, he was promoted to supervisor of bridges and buildings, with headquarters at Vicksburg, Miss., which position he held until his recent promotion, effective January 12.

Obituary

William E. Brown, assistant chief engineer maintenance of way of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa., died on March 16.

Edward B. Wiseman, who retired in February, 1932, as assistant to the division engineer of the Renovo division of the Pennsylvania at Erie, Pa., died at Miami, Fla., on February 26.

John C. Wrenshall, who retired on September 1, 1934, as engineer maintenance of way of the Reading, with headquarters at Reading, N.J., died at his home in Mount Airy, Pa., on March 1, after a year's illness.

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Tindall Arthur Felstead, assistant engineer and chief draftsman for the Western lines of the Canadian Pacific at Winnipeg, Man., died at that point on March 3.

E. E. Baugh, who retired as division engineer of the Valley division of the Atchison, Topeka & Santa Fe on May 1, 1938, died on March 18.

John Lawrence Maher, division engineer of the Staten Island Rapid Transit (subsidiary of the Baltimore & Ohio), with headquarters at St. George, Staten Island, New York, died at the University hospital, Baltimore, Md., on February 12, at the age of 56.

Lewis H. Bond, who retired as chief engineer maintenance of way of the Illinois Central on May 31, 1941, died on February 27 in the Illinois Central hospital at Chicago after an illness of several weeks. A photograph and biography of Mr. Bond were published in the June, 1941, issue following his retirement.

The U. S. War Department reports that Col. **John A. Gillies,** who has been on leave of absence from his post as general manager of the Atchison, Topeka & Santa Fe at Amarillo, Tex., was among several persons killed on February 28, when an American-built plane crashed north of Basra, Irak. Mr. Gillies, an engineer by training and experience, was called to service as a colonel in the Army Engineering Corps in October, 1941.

Edward C. Schmidt, who retired in 1940 as professor of railway engineering and head of the department of railway engineering at the University of Illinois, d'ed on March 21 in a New York hospital after a week's illness. Mr. Schmidt was born in Jersey City, N.J., on May 14, 1874, and graduated from the Stevens Institute of Technology in 1895. From 1895 to 1898, he worked for the Kalbfleisch Chemical Company of New York and Buffalo, N.Y., the C. W. Hunt Company, New York, the Edison Electric Illuminating Company, Brooklyn, N.Y., and the American Stoker Company. In 1898, he became an instructor and assistant professor at the University of Illinois in experimental and railway mechanical engineering. In 1903 he became engineer of the American Hoist & Derrick Co., and in 1904 he went with the Kerr Turbine Co., Wellsville, N.Y., as engineer of tests. Mr. Schmidt returned to the University of Illinois in 1906 as head of the department of railway engineering. During the first World War he served as a major in the army ordnance department on detached service with the United States Fuel Administration and the United States Railroad Administration and in 1919 he became staff mechanical engineer of the North American Company. In 1921 he returned to the University of Illinois as professor of railway engineering and head of that department, which position he held until his retirement. Mr. Schmidt has been active in the American Railway Engineering Association and served as chairman of the committee on the Economics of Railway Location in 1922 and 1923. He was also active in the American Society of Mechanical Engineers for many years and served as chairman of various committees from time to time in that organization.

Association News

Railway Tie Association

Plans are now being made, under the direction of Leonard Perez, president, (The Koppers Company, St. Louis, Mo.) for a more extensive program than heretofore for the annual meeting which will be held at the Netherland Plaza Hotel, Cincinnati, Ohio, on May 6-7. The details of this program will appear in the next issue.

Roadmasters' Association

President A. B. Hillman has called a meeting of the Executive committee in Chicago on April 13 to review the status of committee report work and to attend to other association business. The Proceedings of the last annual convention are now ready for mailing, and will be distributed during the first week in April.

Bridge and Building Association

Forty-one members of the association held a get-together luncheon with President R. E. Dove, in Chicago, on March 17, during the annual meeting of the American Railway Engineering Association, repeating this event which has been held for several years in the interest of closer fellowship among members. President Dove has called a meeting of the Executive committee in Chicago on April 20. There has been a delay in the publication of the Proceedings of the last annual convention, but it is hoped these will be available early in May.

Maintenance of Way Club of Chicago

One hundred and nine members and guests were in attendance at the meeting on March 23, which was addressed by J. B. Martin, general inspector of track, New York Central, Cleveland, Ohio, on The Conservation of Materials to Secure the Maximum Use From Them. In his remarks, Mr. Martin covered broadly the necessity for conserving in the use of materials and equipment all along the line, the need of developing substitutes for critical materials, and for the close scrutiny of scrap, laying particular emphasis upon the importance of securing the maximum service life from rail. The next meeting of the club, which will be the Annual meeting with election of officers, will be on April 27.

Wood-Preservers' Association

Members of the Executive committee met in Chicago on March 18 to formulate the organization for the technical committees for the new association year. New committees were organized on (a) The Pressure Treatment of Oak Ties and Lumber, J. E. Mausteller, chief tie and timber inspector, Seaboard, Jacksonville, Fla., chairman; and (b) Treated Wood Blocks, A. W. Cobley, president, Hicks-Cobley, Inc., Toledo, Ohio, chairman. New chairmen were also selected for existing committees as follows: (a) Douglas Fir Pressure Treatment, J. M. Gurd, superintendent, Timber Preservers Ltd., Elsona P. O., B. C.; (b) Pressure Treatment of Poles, W. R. Yeager, inspection engineer, Western Electric Company, New York; (c) Tie Service Records, C. D. Turley, chief tie inspector, Illinois Central, Chicago; and (d) Service Records of Posts, H. B. McKean, forestry instructor, Louisiana State University, University, La.

Chairmen were re-appointed for other committees, including (a) Preservatives, J. S. Giddings, inspector, treating department, A. T. & S. F., Topeka, Kans.; (b) Pressure Treatment of Southern Pine Ties and Lumber, H. G. McElhinney, assistant sales manager, The Barrett Division, Allied Chemical & Dye Corporation, St. Louis, Mo.; (c) Non-Pressure Treatment of Poles, J. P. Wentling, wood technologist, Consolidated Treating Company, Minneapolis, Minn.; (d) Inspection, H. F. Round, P. R.R., Philadelphia, Pa.; (e) Bridge and Structural Timber, T. H. Strate, division engineer, C. M. St. P. & P., Chicago; (f) Marine Piling Service Records, A. S. Daniels, superintendent, T. & N. O., Houston, Texas; (g) Pole Service Records, H. A. Haenseler, engineering department, Western Union Telegraph Company, New York; (h) Diversified Uses of Treated Wood, A. R. Joyce, Koppers Company, Marietta, Ohio; (i) Treated Wood for Car Lumber, H. R. Condon, Koppers Company, Pittsburgh, Pa.; and (j) Painting of Creosoted Wood, J. G. Segelken, Bell Telephone Laboratories, Inc., New York.

American Railway Engineering Association

At the annual meeting of the association in Chicago on March 17-19, with a total of 1,135 members and guests in attendance, it was announced that the following officers had been elected for the ensuing year: President, H. R. Clarke, chief engineer maintenance of way, C. B. & Q., Chicago; vice-president to serve two years, F. R. Layng, chief engineer, B. & L. E., Greenville, Pa.; directors, G. L. Sitton, chief engineer maintenance of way and structures, Eastern lines, Sou., Charlotte, N.C.; R. A. Van Ness, bridge engineer, A. T. & S. F., Chicago; and C. E. Smith, vice-president, N. Y. N. H. & H., New Haven, Conn. W. F. Cummings, chief engineer, B. & M., Boston, Mass., and vice-president of the association, was advanced automatically to senior vice-president, succeeding Mr. Clarke.

At a session of the Board of Direction immediately following the annual meeting, the Committee on Standardization was reconstituted, from a personnel including the chairmen of all but one of the standing committees of the association, to a committee of four members, with A. R. Wilson, engineer of bridges and buildings, Penna., Philadelphia, Pa., as chairman. Mr. Wilson being the ranking member of the Association of American Railroads on the Standards Council of the American Standards Association. The other members of the reconstituted committee are J. B. Akers, assistant chief engineer, Southern Railway System, Washington, D. C.; E. M. Hastings, chief engineer, R. F. & P., Richmond, Va.; and F. S. Schwinn, assistant chief engineer, M. P. Lines, Houston, Tex.

The Committees on Outline of Work and Personnel have completed the make-up of committees and assignments of subjects for the ensuing year, and a booklet containing the assignments and personnel of committees will be mailed to all members of com-

(Continued on page 302)

mittees early in April. This booklet in addition to showing the change in the personnel of the Committee on Standardization, as already pointed out, will show the following standing and special committees and their chairmen, as well as the new subjects that have been assigned to these committees. Among the chairmen of the committees, those designated by asterisks have been newly appointed.

Roadway and Ballast—A. E. Botts, asst. engr. m. of w., C. & O. Richmond, Va., chairman.

Ties—John Foley, chief, Lumber and Building Material section, Division of Purchases, War Production Board, Washington, D. C., chairman.

Rail—W. H. Penfield, ch. engr., C. M. St. P. & P., Chicago, chairman. New subject—Investigate cause of shelly spots and head checks in rail surfaces for the purpose of developing measures for their prevention.

Track—W. G. Arn, asst. engr., I. C., Chicago, chairman.

Buildings—A. B. Stone*, asst. ch. engr., N. & W., Roanoke, Va., chairman. New subjects—Design of fueling stations for Diesel locomotives; and Design of shop facilities for Diesel locomotives.

Wood Bridges and Trestles—R. P. Hart, bridge engr., M. P., St. Louis, Mo., chairman.

Masonry—A. N. Laird*, bridge engr., G. T. W., Detroit, Mich., chairman.

Highways—J. G. Brennan, asst. to vice-president, N.Y.C. System, Washington, D. C., chairman.

Signals and Interlocking—H. L. Stanton*, asst. ch. engr., signals, P.R.R., Philadelphia, Pa., chairman.

Records and Accounts—C. A. Knowles, valua. engr., C. & O., Richmond, Va., chairman. New subject—Style to be used in the preparation of reports, specifications and other documents.

Water Service, Fire Protection and Sanitation—B. W. DeGeer, engr. water service, G. N., St. Paul, Minn., chairman. New subjects—Different types of detectors for locating water pipe lines and leaks; Use of photo-metric methods for analysis of raw, treated and boiler waters, boiler scale and boiler sludge; Use of water for Diesel locomotives and air conditioning, with character of water required, conditioning, etc.; and Improved pumping equipment and automatic controls.

Yards and Terminals—C. H. Mottier, ch. engr., I. C., Chicago, chairman. New subjects—Service connections on station tracks; Freight car repair facilities; and Engine terminal facilities.

Iron and Steel Structures—J. E. Bernhardt, bridge engr., C. & E. I., Chicago, chairman.

Economics of Railway Location and Operation—M. S. Mannion*, office asst. to ch. engr., B. & L. E., Greenville, Pa., chairman. New subject—Economics of reduction in rate of curvature on existing lines.

Wood Preservation—H. R. Duncan, supt. timber preservation, C.B.&Q., Galesburg, Ill., chairman.

Electricity—D. B. Thompson*, mech. and elec. engr., N.Y.C. System, New York, chairman.

Uniform General Contract Forms—J. S. Lillie*, property and tax comm'r., G.T.W., Detroit, Mich., chairman.

Economics of Railway Labor—H. A. Cassil*, ch. engr., P.M., Detroit, Mich., chairman. New subjects—Labor economies resulting from building up and reconditioning frogs and switches in track, rather than at some central point; Economical location of section gang headquarters with respect to assigned territory; Labor economies of system versus division rail laying gangs; Labor economies derived from continuous welded rail in special locations; Progress made in the stabilization of maintenance of way and structures labor during the summer and winter periods to not only effect economy in labor cost, but also to increase efficiency in and amount of work done; and Economies attached to maximum utilization of roadway machines and work equipment.

Cooperative Relations with Universities—Elmer T. Howson, vice-president and western editor, Railway Age, Chicago, chairman.

Waterways and Harbors—N. D. Hyde*, spec. engr., N.Y.C., Chicago, chairman. New subjects — Prepare abstract of Truman-Hobbs Act and outline procedure under the Act; Procedure with regard to rivers and harbor projects; and Navigable waters—abstracts of court decisions.

Maintenance of Way Work Equipment—C. H. R. Howe*, cost engr., C. & O., Richmond, Va., chairman. New subjects—Manual of instructions for care and operation of maintenance of way equipment; Portable electric power plants and electrically-driven tools; and Rail cranes on combined crawler and rail mountings.

Clearances—A. R. Wilson, engr. bridges and bldgs., P.R.R., Philadelphia, Pa., chairman.

Waterproofing of Railway Structures (special)—J. A. Lahmer, sr. asst. engr., M.P., St. Louis, Mo., chairman.

Impact (special)—J. B. Hunley, engr. of structures, N.Y.C. (west of Buffalo), Chicago, chairman.

The only committee that has thus far made arrangements for a meeting in April is the Committee on Water Service, Fire Protection and Sanitation, which will meet in Chicago on April 21.

The next, or forty-fourth annual meeting of the association will be held in Chicago on March 16-18, 1943, and it is the plan of the Board of Direction to develop a program for this meeting to meet the critical needs of the railways at the time, in the same manner that contributed so largely to the outstanding success of its 1942 annual meeting.

Supply Trade News

Personal

Joseph T. Wright has been appointed manager of the compressor and tool division of the Holyoke, Mass., plant of the **Worthington Pump & Machinery Corporation.**

John J. Davis, Jr., assistant manager of sales at Chicago of the Railroad Materials and Commercial Forgings division of the **United States Steel Corporation,** will have charge of that division during the absence of **Orrin H. Baker,** manager of the division, who is serving with the War Production Board at Washington, D.C.

A. Donnally Armitage, formerly vice-president, has been elected president of **J. H. Williams & Co.,** to succeed **J. Harvey Williams,** who died on February 23. **E. J. Wilcox,** formerly sales manager of the stock products division, has been elected vice-president in charge of stock products sales; **Willard C. Kress,** formerly works manager, has been elected vice-president in charge of all manufacturing; and **Hugh Aikman** and **Clark M. Fleming** were re-elected to the positions of secretary and treasurer respectively. Mr. Fleming will fill the vacancy in the company's board of directors caused by Mr. Williams' death.

W. Lyle McDaniel, assistant chief engineer of the **Massey Concrete Products Company,** Chicago, has been promoted to chief engineer, with headquarters at Chicago, succeeding **Earl C. Alexander,** whose death on February 9 was reported in the March issue. Mr. McDaniel is a graduate of the University of Pittsburgh, was for some years with the Pennsylvania Railroad and later with the Chicago Union Station Company. He has been with the Massey Concrete Products Company since 1920 in various sales and engineering capacities, including that of resident manager at Cleveland, Ohio. Prior to his recent appointment he served for three years as assistant chief engineer.

Edwin H. Brown, manager and chief engineer of the engineer and condenser department of **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., has been elected vice-president in charge of engineering and development. Mr. Brown graduated from the University of Nebraska in 1906 and immediately thereafter entered the Allis-Chalmers course of training for graduate engineers. Upon completion of the two year engineer apprentice course, he served in various capacities with the company, and then became assistant manager of the steam turbine department. In 1935 he was promoted to manager and chief engineer of the engine and condenser department the position he held until his promotion.

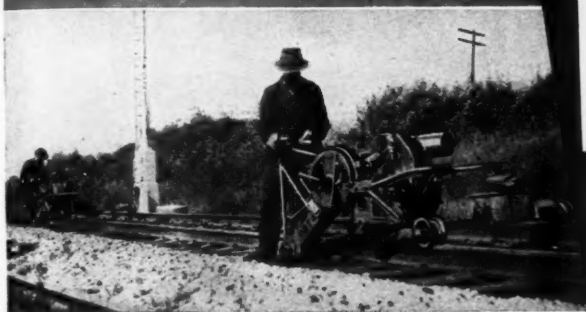
Obituary

Frank J. Boatright, railway department representative in New England for the Dearborn Chemical Company died on February 17.

Edward T. Fishwick, senior vice-president and a director of the Worthington Pump & Machinery Corporation, died March 15 at his home in Glen Ridge, N.J. Mr. Fishwick had been with the Worthington organization for 49 years. He originally started with the corporation at its Cincinnati, Ohio, works. He was also president and a director of the Worthington-Gamon Meter Company of Newark, N.J.; and was formerly head of the Diesel Engine Manufacturers' Association.

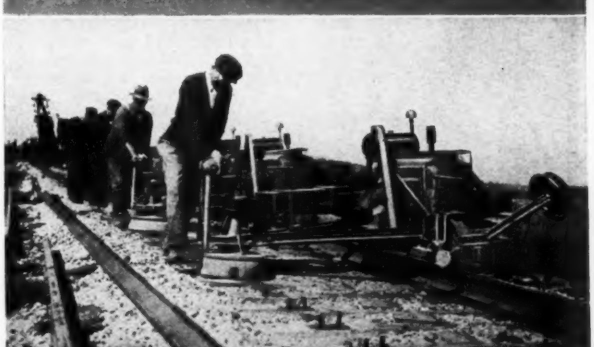
Trackbarrow.—An illustrated folder has been issued by American Trackbarrow, Lowell, Mass., in which is described the various types of Trackbarrow units that are produced by this company.

10 NORDBERG Power Tools help set a record of 910 rails laid in one day



These two Power Wrenches are removing the track bolt nuts from the old rail, while at the rear two more Wrenches bolt up the new rail.

Then come the three Spike Pullers which remove the spikes.



Next are the Adzing Machines preparing the tie seats for the new rail.

Anyone engaged in rail laying operations knows that placing 910 rails in one day with a 170-man gang is an unusual accomplishment. A few years ago, this was unheard of, but today, such speed is possible with a fully mechanized gang equipped with Nordberg Power Tools. On this particular job, there were ten of these Nordberg Tools; four Power Wrenches, three Spike Pullers and three Adzing Machines.

While speed in rail laying is essential in getting track restored to normal traffic quickly and doing the job at less cost, quality of track work is even of greater importance. Nordberg Tools not only speed up maintenance operations but they do their jobs in keeping with the high standards demanded by today's heavy high speed traffic.

If your rail laying operations are not completely mechanized, investigate the merits of the line of maintenance machines Nordberg developed to do your jobs faster, better and at lower cost.

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Whether for rail laying or normal maintenance of rail and switches, there is a Nordberg Tool designed to meet your needs.

Power Wrench	**Spike Puller**
Adzing Machine	**Rail Drill**
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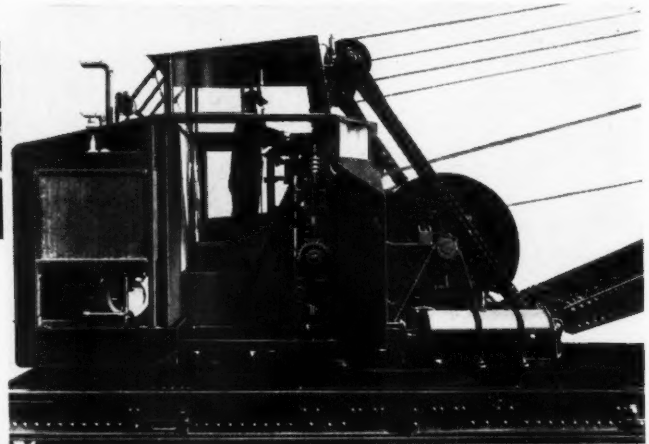

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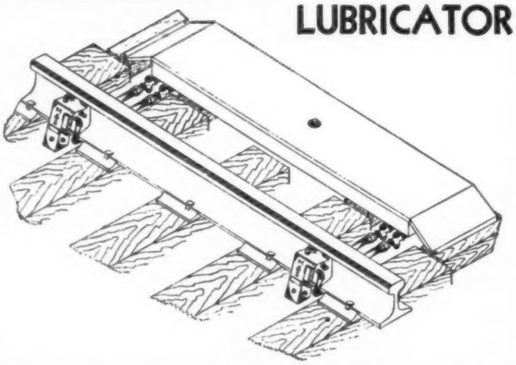

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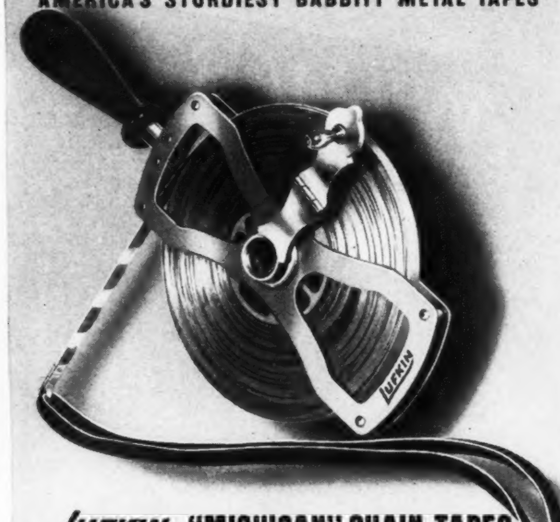

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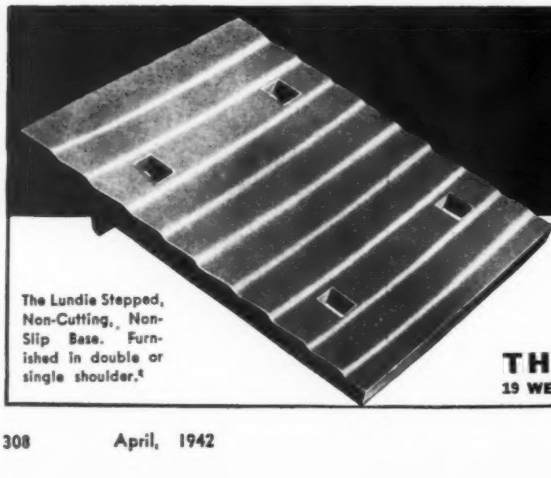

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